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UPGRADES



WINDOWS 8: THE FINAL VERDICT

Ashton Mills on why you should upgrade — and why you shouldn't

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APC is changing

Part 1 of APC's redesign launches this issue.

If you look carefully, you'll notice several changes in this month's APC. We say look carefully, because at first glance, not much appears to have changed. Unlike the radical redesign that morphed our sister mag *PC User* into *TechLife*, APC is undergoing what we're calling internally a 'BMW makeover', where the new model looks a lot like the old one, except that it's better. There will be two phases to the evolution of APC.

USER INTERFACE REFRESH

First up, there's been a refresh of the magazine's UI, so to speak. Our new APC designer David Collins has made many tweaks to fonts, colour, layout and labelling; the first comprehensive changes since a significant redesign of APC two years ago. We've also removed some fonts that are hard to read in some circumstances.

So while APC may not look that different, it's now stylistically more consistent across the board. The fundamental philosophy behind the design refresh is to improve usability (by contrast, *TechLife*, is going for a more cutting-edge look in keeping with its goals of reaching a broader audience and the younger smartphone/tablet-obsessed generations).

MORE APPLE

Secondly, from this issue, we're expanding the coverage of all things Apple. I know this is controversial since there are many APC readers who believe we should

focus only on the PC and Windows. However, the reality of personal technology today is that the world is more interconnected, and we know from our market research that many of you have to deal with mixed environments of Windows, Apple and Linux products both at home and in the workplace.

To continue ignoring Apple is to do many of you a disservice, so from this issue, I welcome Matthew J. Powell, who is regarded by many as the finest Apple reviewer in Australia. The immediate result is Powell's superb piece on Apple's new OS, Mac OS X Mountain Lion, on page 16, a story that highlights his supreme knowledge of Apple's OSs.

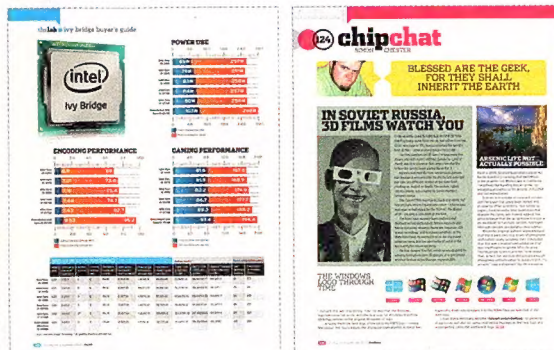
PART 2 NEXT MONTH

In part 2 of our APC refresh, coming in the October issue, we're introducing more new content and a restructuring of the magazine sections as we update the magazine's coverage of tech across the board. Some of the changes have been made possible by the seconding of former *PC User* tech guru Darren Yates to APC. Darren was a stalwart of *PC User*, and while he's still there (as contributing editor for *TechLife*) we've let him loose on APC with a brief to go as geeky as he wants. I'm excited about a new regular tutorial that Darren will introduce and lead next month.

So with a design refresh, Yates and Powell on board, and more to come next month, APC continues to deliver unparalleled coverage of tech for our tech savvy readers.



APC would like to welcome Matthew J. Powell to its pages. He's one of the best Apple commentators around.





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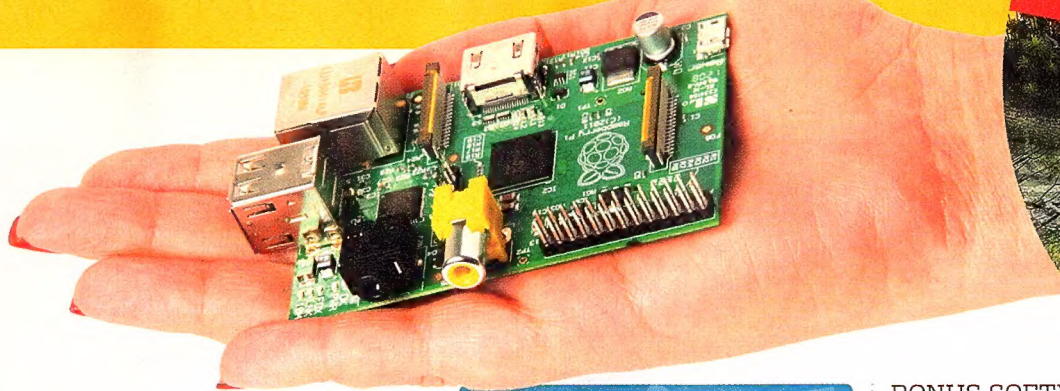
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make a \$50 pc

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Blessed are the geeks for they shall inherit the Earth.

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on the dvd



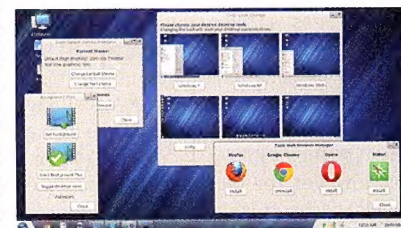
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A new unique Ubuntu-based distro created specially for Windows users wanting to shift to Linux.

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TONY SARNO

After my first two hours with Windows 8, I was still struggling to navigate it. This is insane.



So much hogwash has been written about the post-PC era that I really need to weigh into the debate. As you've probably read, the post-PC era is supposed to be an exaggeration about the dethroning of the PC as the central computer in people's lives, a role being taken over by tablets and even smartphones. Actually, it's not an exaggeration. It's happening and the main evidence for this is coming from Microsoft itself, the former champion of the PC. Microsoft has reconstructed Windows to work across tablets and smartphones because internal Microsoft research shows that revenue from desktop apps is about to collapse in the next two years – unless Microsoft successfully ports them to the mobile devices everyone is using.

However, the fact that the post-PC era is upon us doesn't mean the PC is dying. Far from it. All Microsoft is doing is shifting focus to tablets and smartphones in the consumer space, where it needs to be a player to keep selling the same numbers of Office and Windows licences. But it's not abandoning the world of serious computing, in business and creative industries and gaming. The PC will continue there with Microsoft software powering the majority of machines sold, but they'll have more specialised roles, basically doing the many complicated things tablets can't do.

What I think can really hurt Microsoft isn't the post-PC era, but how Microsoft deals with it. I'm not convinced that its one-size-fits-all solution of Windows 8 is the answer. This is a great OS on a tablet, but on a desktop it still hasn't won me over. I'm a tech magazine editor and after my first two hours with the release preview, I was still struggling to navigate it. This is insane. It's ironic that in its mad rush to embrace the tablet, Microsoft could severely damage its hold on the desktop with possibly a modern-day version of Vista.

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apc

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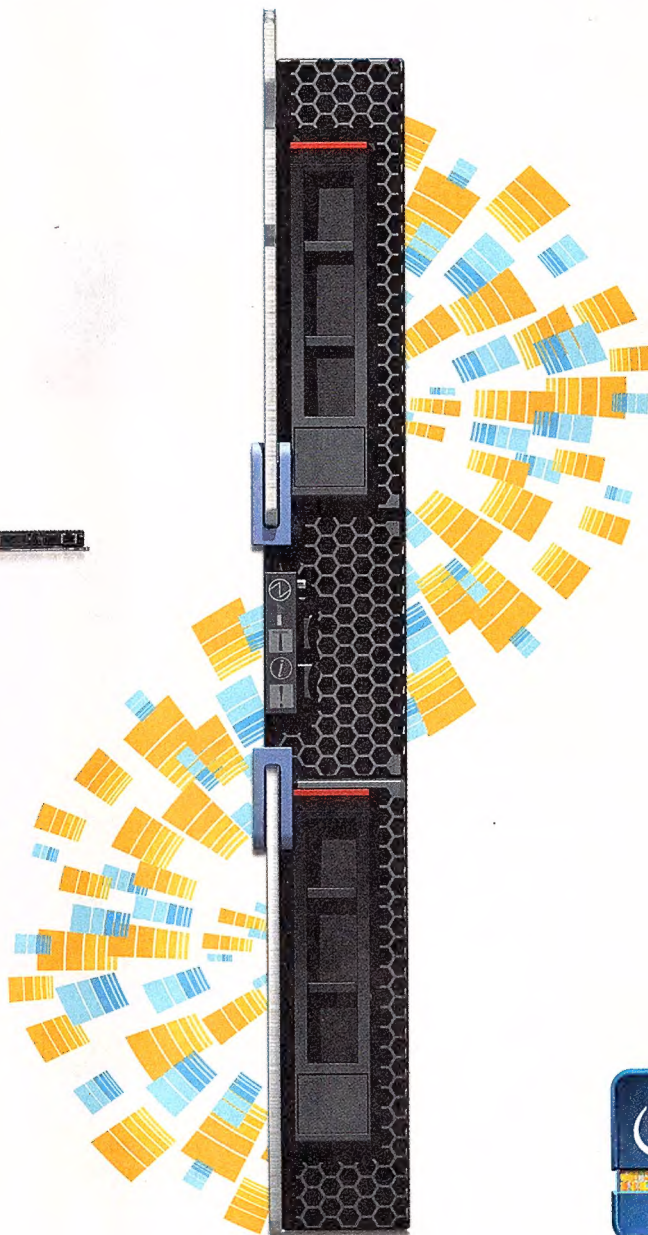
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1. Source: Intel Performance comparison using SPECint_rate_base2006 benchmark. Baseline score of 262 on prior generation 2S Intel® Xeon® processor X5690 (3.46 GHz, 6 core, 12MB L3, 6.4 GT/s, 130W) based platform published at www.spec.org as of 6 Sept 2011. New score of 479 on 2S Intel® Xeon® processor E5-2680 (2.70 GHz, 8 core, 20MB L3, 8.0 GT/s, 130W) based platform published at www.spec.org as of 21 March 2012 using two Intel® Xeon® processor E5-2680, Turbo Enabled, EIST Enabled, Hyper-Threading Enabled, 128 GB memory (16 x 8GB DDR3-1600), Red Hat® Enterprise Linux Server release 6.2 for x86_64, Intel® Compiler 12.1. 2. Comparison of virtual machines based on IBM internal sizing estimates when comparing HS23 using Intel® Xeon® E5-2680 processor with 256GB memory to HS22 using Intel® Xeon® X5690 Processor with 192GB memory. 3. IBM Global Financing offerings are provided through IBM Credit LLC in the United States and other IBM subsidiaries and divisions worldwide to qualified commercial and government clients. Rates for credit-qualified clients and are based on a client's credit rating, financing terms, offering type, equipment type and options, and may vary by country. Other restrictions may apply. Rates and offerings are subject to change, extension or withdrawal without notice. The 0% financing over 12 months offer is valid for all purchases of eligible products which are installed on or prior to September 28, 2012. IBM may withdraw this offer at any time. 4. Certified platinum by 80 PLUS Organization, 2010, visit www.80plus.org for more information. Direct link to certification: http://www.pluginloadsolutions.com/psu_reports/IBM_39Y7414_2980W_SO-188_%20Report.pdf. IBM hardware products are manufactured from new parts or new and serviceable used parts. Regardless, our warranty terms apply. For a copy of applicable product warranties, visit: http://www.ibm.com/servers/support/machine_warranties. IBM makes no representation or warranty regarding third-party products or services. IBM, the IBM logo, ibm.com and BladeCenter are trademarks of International Business Machines Corp., registered in many jurisdictions worldwide. A current list of IBM trademarks is available on the Web at www.ibm.com/legal/copytrade.shtml. Intel, the Intel logo, Xeon and Xeon Inside are trademarks or registered trademarks of Intel Corporation in the United States and other countries. All other products may be trademarks or registered trademarks of their respective companies. All prices and savings estimates are subject to change without notice, may vary according to configuration, are based upon IBM's estimated retail selling prices as of 15/05/2012 and may not include storage, hard drive, operating system or other features. Reseller prices and savings to end users may vary. Products are subject to availability. Contact your IBM representative or IBM Business Partner for the most current pricing in your geographic area. © Copyright IBM Australia Limited 2012. ABN 79 000 024 733. © Copyright IBM Corporation 2012. All rights reserved. IBMCCA1420/BLADEHS23/APC/FPC

METRO STORE

WINDOWS 8 APPS

Windows 8 Metro-oriented apps don't yet cut it on the desktop.



We all know the reason for Windows 8 – it's designed to make Microsoft relevant in the tablet market and leverage its desktop dominance by giving users an OS that works across all devices, from smartphones and tablets to PCs.

But what about the apps? It's still early days because Windows 8 doesn't launch until late October, but from what we can see in the Windows 8 app store, the apps designed for the new Metro UI are less than inspiring.

The apps remind us more of simple tablet apps than ones we expect to see on a PC. The overall breadth and depth of apps designed for the Metro interface is disappointing. We're not seeing any of the familiar heavyweight desktop software Windows 7 users are familiar with. Even Microsoft Office will need to sit in Windows 8's traditional desktop when the new OS launches.

Here are some of the best apps we could find in the Metro Store at the time of going to press. Slim pickings indeed. As well, many of the apps we tested didn't work on our system either (Evernote, for

example). We've not covered them in this guide for obvious reasons, but Microsoft's store might need a better quality control procedure before it's ready for the big time.

WIKIPEDIA

The Wikipedia app highlights Microsoft's landscape design ethos for Metro. Whereas once you viewed the world's largest encyclopedia top to bottom, you now browse articles left to right. It's a little unnerving and we aren't entirely sold on the format, but the app itself is a clean and functional effort. It conjured up memories of the glory days of Microsoft Encarta for us.

TWEETRO

Tweetro is a brilliant app. It's good-looking, relatively quick and it links you to your Twitter account seamlessly. Unfortunately, it's also a prime example of the Metro interface not really suiting desktop PCs. Everything is spaced out and written in impeccably chosen but improbably large sans serif text, removing the quick hit consumption of traditional desktop apps like TweetDeck or HootSuite. One for tablets only.



MUSIC MAKER JAM

KINDLE

Now here's an app that we expected to see and it's just as we imagined: clean, fully cloud-connected to your Kindle docs and easy to use. You can adjust fonts and colour modes easily, and there's all the usual functionality you'd expect. Amazon's Kindle app for Windows 8 is about as close to reading on an actual Kindle device as you're likely to get and that's a good thing.

NEWSY

This is Metro done right – almost. Newsy's tiles give you a quick peek

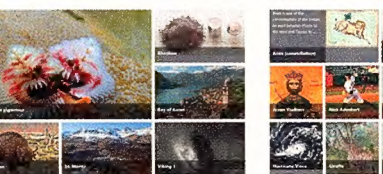
into the streaming video stories that lie behind them, each of which is an original report based on a number of quoted and easily clickable sources. It's professional and informative, and is only let down by the somewhat restrictive text layout. This is one to watch, quite literally.

MUSIC MAKER JAM

Windows 8's touchscreen slant translates perfectly to this sort of thing. Music Maker Jam takes Magix's experience with musical building blocks and applies an interface that just begs to be

pedia

ictures



WIKIPEDIA



NEWSY

touched and swiped. The results are very nice, and it certainly suggests that Metro would be a good home for higher-end apps like Ableton Live.

URZA GATHERER

Unless you're a hardcore *Magic: The Gathering* card collector, this app will be of little interest to you. It's a catalogue of the 17,000 cards that have been part of the game over the years, but it shows off Metro nicely. It's a tiny download, has a bold interface and makes it easy access to all the information you need in a couple of taps. There

could be more interactivity, but this is definitely the tactile future of visual databases.

STUMBLEUPON

This app cries out for a live tile that takes you directly to the random page it's highlighting. The Windows 8 version of the app doesn't have that feature yet – in fact, it currently seems to be highlighting stories from 2009 – but we'd put money on it working at Windows 8's final release. We'd also put money on its interface becoming slightly less obtuse when everything's finalised: with

a mouse and keyboard it's easy to get lost or stuck.

SKETCHBOOK EXPRESS

We've seen this sort of thing on other touchscreen platforms (there are plenty of similar apps on the iPad, for example), but Autodesk's sketching toy makes good use of the space available. Using two little pucks, you can tweak the colour and size of your brush and the actual drawing experience is generally smooth, though this will vary depending on the muscle of your processor.



MICROSOFT APPS

Here are the key apps Microsoft itself is putting forward. Clearly they're meant for tablets.

NEWS

Big, bold and incredibly accessible, Microsoft's News app might cover many of its carefully selected pictures with words, but the clearly attributed sources mean you can avoid articles from particular sources.

TRAVEL

This is perhaps a bit obscure given its prominence on the Metro Start screen. Maybe Microsoft is expecting Windows 8 users to be the kind who jet off worldwide on a whim? It's pretty, but you'll get more interesting information from online sources.

FINANCE

This won't be your first port of call if you're serious about the money markets, but it's a stylish way to watch the economy. Its news, graphs and customisable stock watching are excellent.

SPORT

The Sport app focuses on at-a-glance info. The football section, for example, allows you to filter news regarding your favourite team, and you can add and remove sports manually to your liking.



TOP 10

SITES BLOCKED BY CHINA



01 GOOGLE DOCS, DRIVE & SITES

Because they let people work collaboratively and share info.

02 FACEBOOK

Enables the widespread sharing of information.

03 TWITTER

A driver of the Arab spring, so no!

04 WIKIPEDIA

Has too many articles on taboo subjects such as Tibet.

05 YOUTUBE

Essentially a people's TV station.

06 BLOGSPOT & WORDPRESS

Blogs can be used to spread information.

07 ARCHIVE.ORG

A historical archive of internet pages.

08 IMDB.COM

The internet movie database refers to a doco on the Dalai Lama.

09 SCRIBD

A document sharing web site.

10 XVIDEOS & OTHER PORNO SITES

Might impact on the one-child policy.



INTEL POCKET CONCERT AUDIO PLAYER

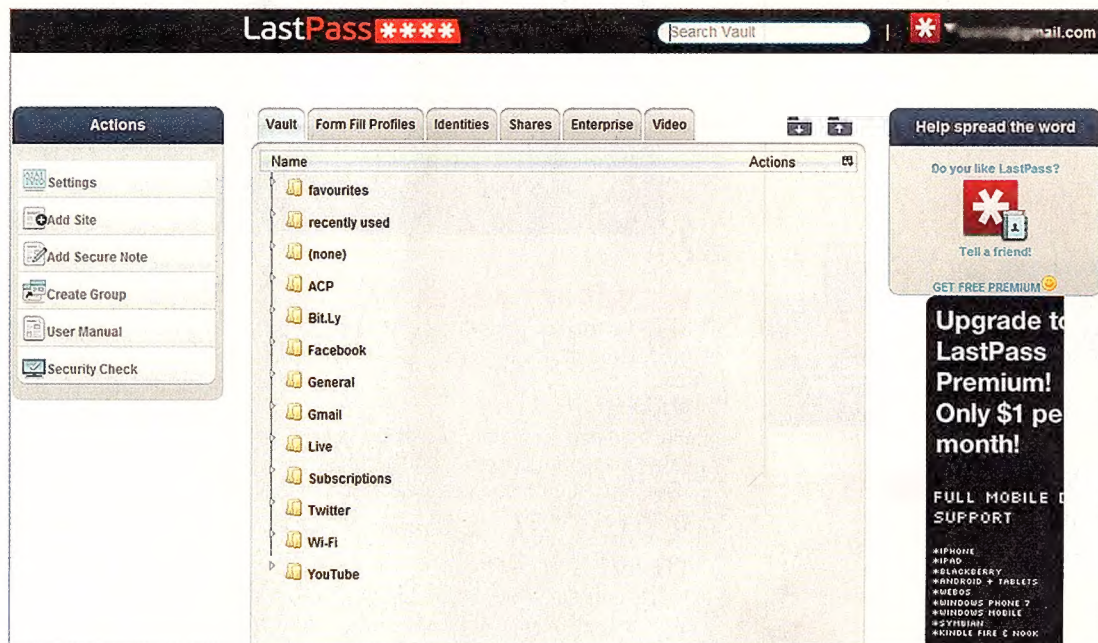
Intel's first foray into portable audio is a crafty move. It's keen to see the personal computer play a greater role in daily life. With 128MB of flash memory on tap, Intel's slick-looking music player, the Pocket Concert, can hold a solid two hours of tunes ripped as 128Kbps near-CD stereo MP3s, and twice that again if you use the tighter compression afforded by Microsoft's WMA format.

FLAT SCREENS TAKING OFF

Flat-screen panels are gaining in popularity due to LCD technology and falling prices. Companies like Apple and IBM are leading the charge to make LCD the standard with many new PCs. Apple is the most aggressive: it's already begun phasing out CRTs and shifting to digital LCD screens, except for the all-in-one Macs.

COMPAQ EVO N400C

Compaq's new small, light laptop, the Evo N400c, sacrifices CD-ROM and floppy drives peripherals for portability. With a Mobile Intel Pentium III 8, it operates quite well and had very reasonable benchmarks, but you pay for portability. It'll set you back \$5,095.



SECURITY

PASSWORD FAIL

Password management is clearly too complex for ordinary users — so move on to a password manager, argues **Gary Marshall**.

Last month, six and a half million LinkedIn users' accounts were compromised, and while the social network kept quiet about any security breach, the details were being shared on a Russian hacking site. Such security violations are depressingly commonplace, with Last.fm and eHarmony suffering similar, albeit smaller, attacks in the same week.

Is it time to revisit the way we manage passwords? Graham Cluley is senior technology consultant with Sophos (www.sophos.com). He argues that passwords are still the 'least worst' security we have. He says, "What we need to do is to get people to choose stronger, harder-to-crack, unique passwords, and for web sites to both encourage the use of better passwords by refusing weak ones and to learn how to better secure the information they store about users." That's particularly important if one login is used across multiple sites that's used to access several sites or services.

It'd be a big help if hundreds didn't think 'LinkedIn' was the perfect password for their LinkedIn accounts. When security firm Rapid7 analysed the leaked LinkedIn accounts, it discovered that many passwords were shockingly simple: the most popular included 'link', '1234', '12345', '123456', 'work', 'job', 'god' and 'sex'. As Rapid7 reported, "We're seeing a trend of internet users trying to use simplistic passphrases on internet sites... password cracking algorithms include these bad passwords as part of their recipe."

USE A PASSWORD MANAGER

Remembering a single complicated password is hard enough, but remembering individual passwords for

each site, shop or service we use is impossible. You can solve that problem with password management software, which can help generate unique, hard-to-crack passwords and store them securely.

One of the more popular solutions is LastPass (www.lastpass.com), which works across PCs and browsers (and if you pay for a premium account, mobile devices too), securely storing complex passwords so that you don't need to carry them in your head.

The idea of using a cloud-based password manager might be a little less scary if LastPass itself hadn't announced a hacking attempt last summer. After noticing unusual network activity, the service warned of a possible intrusion and urged its users to change their master passwords. Luckily, the hack turned out to be a false alarm, but LastPass beefed up its security anyway, just in case.

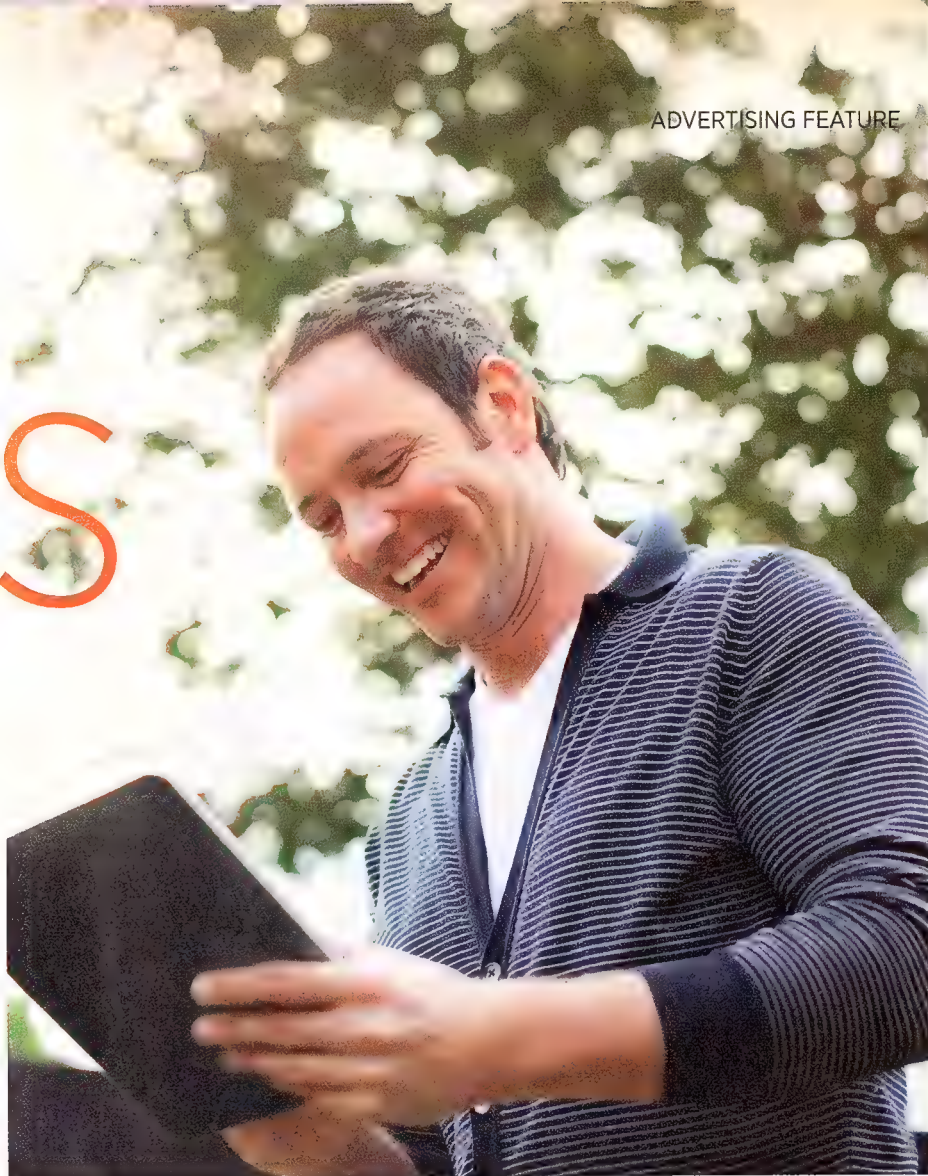
It turns out that the weak link in a LastPass-style system isn't the site, but the user. Your data is encrypted locally before it's sent to LastPass, the key to decrypt your passwords isn't stored online, and if you're feeling particularly paranoid, there's a free tool called Sesame that you can use as an extra authentication stage so that even if a third party has your master password, they won't be able to access your LastPass account.

That can only do so much, however: if your existing passwords are fairly weak and easy to guess and you don't change them to make them much more secure, no amount of encryption or authentication is going to protect you. **ABC**

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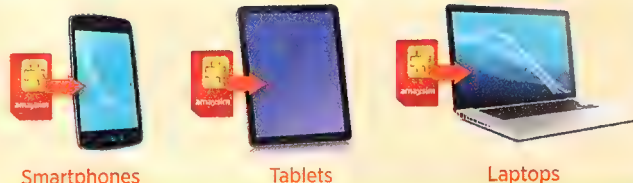
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Garmin Fenix

Adventure seekers will love this do-it-all wristwatch. GPS navigation keeps track of where you are, a barometer and temperature sensor help you monitor the weather and an altimeter provides elevation information. We love the TrackBack feature, which leads you back to your camp site or start point. The Fenix is water-resistant to 50m and tracks distance and speed while cycling. Wi-Fi and Bluetooth are included so you can share data with compatible devices.

ONLINE www.garmin.com.au



\$449

G-Drive Mini

It's super-fast, can withstand some rough treatment and it's compact – what more could you ask for from a portable hard drive? The G-Drive Mini is a 7,200rpm USB 3.0 drive, so it's significantly faster than a standard USB 2.0 drive. It sits in a classy-looking, all-aluminium enclosure and has a built-in heatsink to dissipate heat. The drive is formatted for Mac OS X systems out of the box, so it's a great solution for my MacBook, but a simple tweak is all it takes to make it Windows-ready.

ONLINE g-technology.com



\$119.95

Fitbit Ultra

I know the road to fitness is paved with plenty of exercise and low-calorie meals, but even the optimist, I'm hoping this little pocket trainer will make my journey a little easier. It's a thumb-sized motion sensor that's designed to be worn 24/7. Like a high-tech pedometer, it records steps taken, calories burned, distance travelled and more. It also monitors your sleep hygiene – how long it takes you to get to sleep, how many times you wake and the amount of time you spend in bed. Sounds good, but I'm waiting for a model that will cure chocolate cravings.

ONLINE www.fitbit.com/au



500GB
\$176
750GB
\$187

Kogan Agora Smart TV HDMI Dongle

Turn your boring TV into a smart TV with this Kogan dongle. Plug it into your HDMI port and you can access the web, check your emails, watch movies and more. The dongle runs Android 4.0 and has 4GB of internal storage and a microSD card slot, so you can store a heck of a lot of movies and photos on the device, ready to watch on your TV. There's Wi-Fi, and the dongle comes with a remote control. Keyboard and trackpad also available. **ONLINE** www.kogan.com/au



\$99

\$300



iHome iP4

The first thing I thought when I saw the iP4 was, "Damn, that's ugly", but so was the '80s tech it's modelled on. With that in mind, this boombox-shaped iPod speaker starts to look cool – in a retro way. The insides are impressive, with 4in carbon-composite woofers and 1in fluid-cooled tweeters. The iP4 has SRS TruBass for that boombox thumping bass and a five-band EQ and LCD screen round out this modern stereo for nostalgia lovers.

ONLINE www.ihomeaudiointl.com



\$799

Panasonic HC-V700

We've tried plenty of camcorders, but the new HC-V700 is one of the most feature-packed we've seen. It records in Full HD and comes with a 28mm wide-angle lens so it's easier to shoot a subject at close range without sacrificing too much background. There's a 3in touchscreen and an LED for low-light filming. But the most exciting feature is the ability to shoot 3D images with an optional lens. There's also an inbuilt 2D-to-3D conversion function.

ONLINE www.panasonic.com.au

FEATURE

OPTUS 4G VS TELSTRA 4G WHO'S QUICKER?

Optus is finally launching its 4G offering. **Alex Kidman** tests the first trial run in Newcastle and is impressed.

While it's possible to argue that we don't have any actual 4G in Australia, given that the LTE variant Telstra introduced last year tops out at 40Mbps, which is a bit short of the LTE Advanced proposal of 100Mbps, it's pretty clear that what we're getting is what will be called 4G for the time being, especially in light of the ACCC's smackdown of Apple over the third-generation iPad's marketing. However, a single provider doesn't make for much in the way of competition, so when Optus offered us the opportunity to grab one of its test kits and have a decent trial session in the Newcastle/Hunter Valley region, we immediately snapped it up.

The best way to do a comparative test, naturally enough, would be to compare like with like as much as possible. In the case of the Optus test kit, this was rather more similar than we expected. From a regulation standpoint, while Optus's acquisition of Vividwireless does open up some new avenues for it to pursue 4G networks, and

the upcoming sale of the 700MHz spectrum – something Optus has trialled in Bendigo at up to 70Mbps – has potential. For now, both Optus and Telstra are rolling out LTE at 1,800MHz.

That's not the only point of similarity, though. For the trial area – Optus still states it'll hit Sydney, Melbourne and Perth by the middle of the year – Optus is using the Sierra Wireless AirCard 320U modem, as well as a NetComm Wireless N150 M2 router for those utilising 4G as a 'fixed' connection. The AirCard 320U is exactly what Telstra sells as its 4G USB modem, so we paired the two up, installed both clients on a MacBook Air and headed to the Newcastle region to do some on-the-spot testing.

We used the Speedtest.net web application running on Google Chrome, with each test run four times and averaged to get an indication of relative speeds. As with all things mobile, speeds can vary over time, and Optus does have a very small 'out' here, in that the Newcastle/Hunter test sites are just that: test

sites. Still, it'd be disappointing if they couldn't at least compete.

One side note here. The supplied AirCard works at 850MHz for 3G and 1,800MHz for 4G LTE, which means Optus's current 4G trial modem doesn't actually work on its own 900MHz 3G network at all. Naturally, this won't be the exact model it'll go to market with; once Optus is in the commercial 4G space, it'll be selling devices that will step down gracefully to Optus's 3G coverage.

In each case for our tests, we waited and tested that the two AirCard modems were registering a 4G connection before commencing tests. In terms of testing head to head, Optus's suggested coverage maps for the area are much more widespread than Telstra's, although whether that's a long-term plan isn't terribly clear. To keep things accurately head to head, we tested in areas where both carriers claimed they had 4G signal: two spots in Newcastle (one very close to the CBD and one just outside it), as well as in Maitland's CBD to the north and as far



Our 4G test system.



We had great test results from Optus in the Newcastle area.



The Telstra test results in the Maitland area were better than Optus.



Telstra proved faster than Optus in Wyong.

south as both still offered 4G coverage in Wyong. As you can see from the photos, high-tech testing isn't always glamour and exciting locations.

Optus's track record with the delivery of wireless broadband isn't one that's replete with victories over Telstra. While it attracted many data users, thanks to cheaper plans, it did so at the expense of data speed. In the relatively untested 4G arena, we were keen to see if Optus could step up because if it was bested

by Telstra, even a fighting effort would keep pressure on to drop mobile data prices.

So how did the two foes stack up? Optus had an early victory in the Newcastle CBD, where its average download speed was a tad higher than Telstra's, but everywhere else Telstra's performance was markedly better. In our second Newcastle test site, we registered full bars of 4G coverage from Optus, but got what was sub-par 3G performance instead. Even with the excuse that the Optus network

is in trial mode, Telstra has signed up a lot of 4G customers, which should bring the average speeds down, not up. Regardless, excluding that second Newcastle site, Optus's 4G performance utterly swamped the performance that you could expect out of 3G.

With Vodafone only recently stating that it'll offer 4G services from next year – despite originally stating it'd do so from December 2011 – it looks like the mobile future is going to be particularly fast. **BUT**

4G SPEED TEST RESULTS (Mbps)

	Newcastle			Just outside Newcastle CBD			Maitland			Wyong		
	Ping	Download	Upload	Ping	Download	Upload	Ping	Download	Upload	Ping	Download	Upload
Optus	42	22.67	6.05	236	1.25	0.43	35	24.2	10.9	37	31.24	13.36
	41	21.83	6.65	230	0.53	0.93	33	23.82	10.84	34	31.08	14.72
	38	23.27	7.19	41	0.75	0.99	32	24.22	11.85	34	33.89	12.49
	34	21.6	7.24	238	0.88	0.01	34	27.72	14.02	33	35.07	13.4
	41	21.93	7.54	729	0.2	1.2	30	24.88	13.76	29	34.77	12.2
Average	49	27.825	8.6675	368.5	0.9025	0.89	41	31.21	15.3425	41.75	41.5125	16.5425
Telstra 4G	57	21.01	12.43	54	21.55	5.37	50	22.35	10.42	55	40.68	10.19
	56	23.99	11.74	56	21.53	3.56	57	16.43	9.36	58	40.36	12.37
	46	20	9.32	57	23.26	4.8	57	22.08	8.7	51	41.93	10.01
	53	17.8	7.55	57	24.73	5.42	51	19.84	8.6	53	30.07	11.66
	55	22.64	8.73	49	25.09	4.95	49	26.5	9.61	57	35.42	10.35
Average	66.75	26.36	12.4425	68.25	29.04	6.025	66	26.8	11.6725	68.5	47.115	13.645
Telstra iPhone 3G	174	2.48	0.56	116	2.18	0.91	118	1.07	0.47	176	8.14	1.22
	182	3.58	1.49	189	1.36	1.2	266	1.45	0.24	175	8.39	1.7
	169	3.14	0.36	189	3.03	1	640	0.74	0.15	183	5.64	2.29
	179	2.87	0.46	200	1.9	0.92	120	1.29	0.07	166	7.43	2.95
	103	3.49	0.57	187	2.23	0.74	131	0.6	0.01	165	5.63	3.4
Average	201.75	3.89	0.86	220.25	2.675	1.1925	318.75	1.2875	0.235	216.25	8.8075	2.89

FEATURE



OS X 10.8

MAC GOES TO THE MOUNTAIN

Apple boasts of over 200 new features in Mountain Lion, the latest version of its operating system for Macs. Our new Mac writer, **Matthew J. Powell** highlights the important ones.

There are some features in Mountain Lion that will make a big difference for every Mac user, but for the most part, it's about security.

There's been a fundamental shift in Apple's mindset about security in recent times. Mac OS X was always a fairly secure beast, but Apple didn't make too much noise about it. The attitude was basically 'it's not Windows, so you don't have to worry about all those Windows nasties'. A few actual malware attacks on the OS X fortress in recent years have changed that. For the first time security is front and centre of Apple's communication on Mountain Lion – not only in what are explicitly 'security' features, but throughout the OS.

For a start, there's Gatekeeper. A logical extension of the App Store, Gatekeeper is a setting in the 'Security & Privacy' pane of 'System Preferences' that allows you to stop your Mac from installing software other than that which comes from trusted sources. In its strictest mode, Gatekeeper will only

install software from Apple's own App Store. Anything else you download or try to install from disc will be blocked.

The obvious advantage is that Apple has vetted every bit of software to make sure it isn't concealing malicious intent. To gauge whether this is an effective approach, compare the number of malware attacks on Android smartphones to the number of attacks on non-jailbroken iPhones.

The default setting for Gatekeeper is to allow software from the App Store and from 'identified developers'; that is, those who have a key from Apple that they can use to tag their software so the system knows to trust it when it arrives. Expect major developers like Microsoft and Adobe to have such keys, rather than going through the App Store where they'd have to hand Apple a chunk of their revenue.

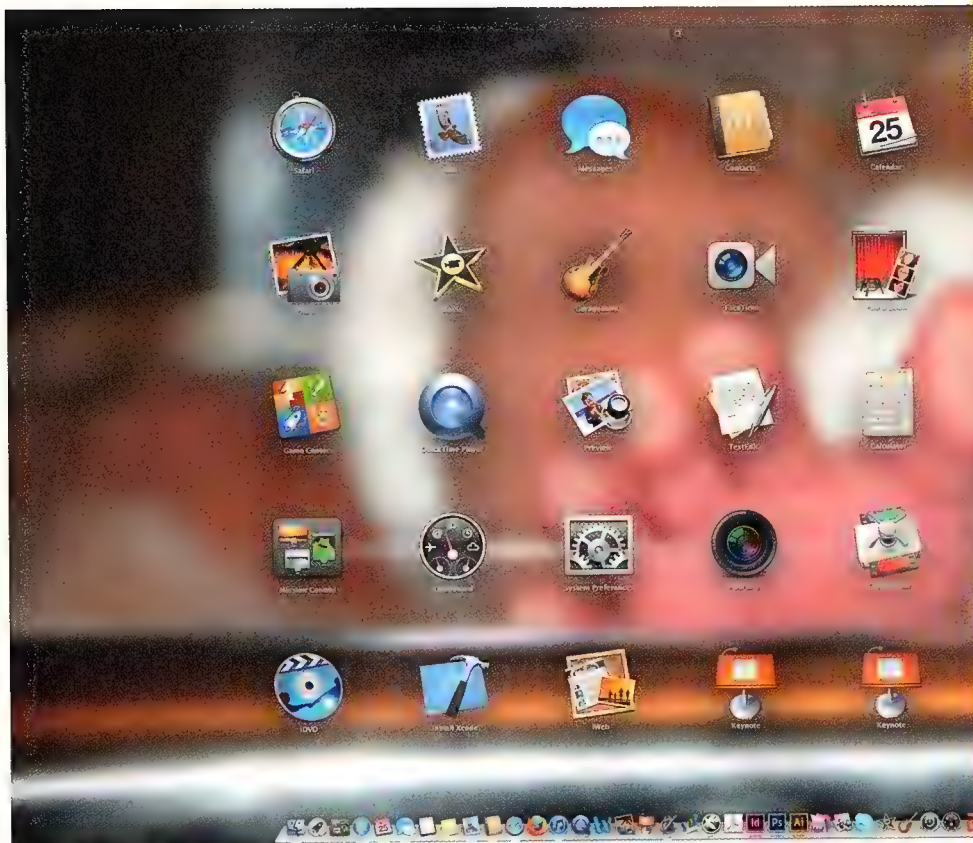
Of course, you can tell Gatekeeper to get out of the way and allow you to install software from 'Anywhere'. If you select this, you get a warning that doing so makes your Mac less

secure. And it does – all the recent malware attacks on OS X involved users installing untrustworthy software.

Then there's sandboxing, in which certain apps operate in their own little bit of protected memory and can't do anything to the rest of the system. Safari has been sandboxed for a couple of OS X versions now, but in Mountain Lion, other potential vectors for attack such as Mail, FaceTime (videoconferencing), Reminders and Notes are all similarly sandboxed.

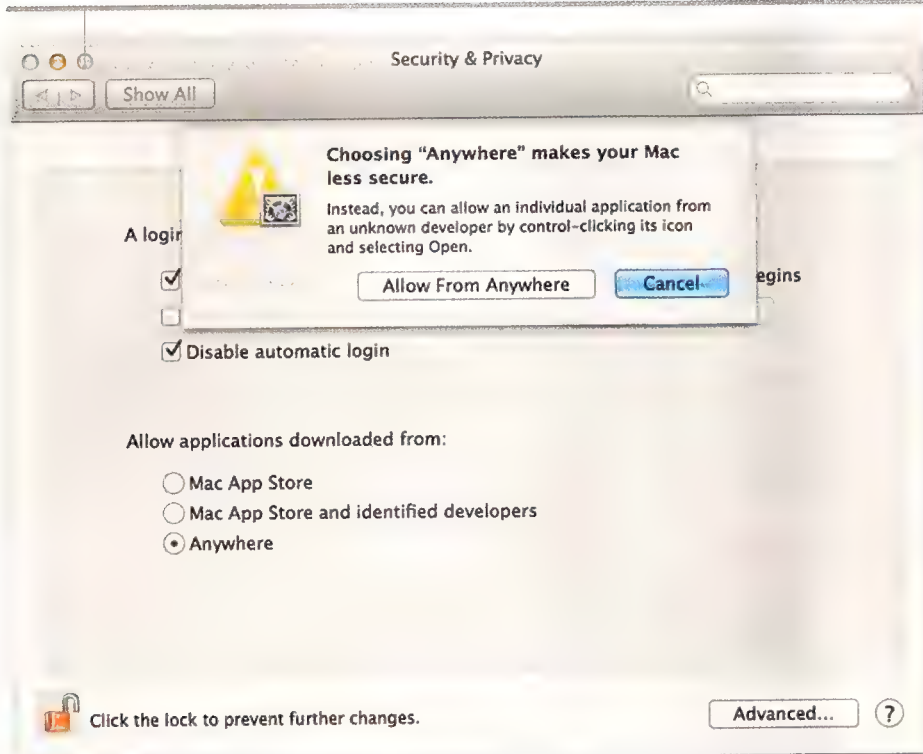
And for the technically minded among you, there's Address Space Layout Randomization (ASLR). What that means is when apps run, they don't always run in the same bit of RAM. This makes it harder for attackers to know which bits of your computer to attack. ASLR has been in OS X since version 10.5 (Leopard), but Mountain Lion extends it all the way down to kernel level, so the whole OS operates this way.

Also at the kernel level, the system is able to recognise the difference between executable code and data, so that if someone tries to



No, this doesn't really look like an iPad. OS X's LaunchPad is an alternative way to launch applications, if you really want it.

You can open the doors and install whatever software you want on your Mac, but you'll be told you're making yourself less safe by doing so.



sneak a nasty bit of software into your system pretending to be harmless data like a celebrity sex video (hey, I'm not judging you), the system won't allow it to run.

Why does this matter? The number of malicious attacks on the Mac is still laughably small compared to the number of attacks

on Windows and there still hasn't been a successful self-perpetuating virus to attack OS X. But the difference between zero attacks and not-zero attacks is significant, and you can bet the number will grow as the Mac's popularity increases. Apple obviously wants to get out in front

IS OS X TURNING INTO IOS?

More than a few of the new bits of Mountain Lion bear a close resemblance to things you'll find on the iPad and iPhone. iCal and Address Book have been usurped by Calendar and Contacts, and there are separate Notes and Reminders apps that used to be part of Mail.

There's a 'Mail, Contacts and Calendars' pane in 'System Preferences', mirroring the section in iOS's 'Settings' app (though 'System Preferences' is still called 'System Preferences', not 'Settings' – maybe that's for next time). iChat has been replaced by Messages, which like the app of the same name on iOS, gives access to Apple's iMessage service plus other instant messaging systems including AIM.

Gestures are also more widespread in Mountain Lion, to the point where a mouse is nowhere near as useful to you as a trackpad.

Does all of this mean Apple is working its way towards a point where its two operating systems become one, just as Microsoft is attempting with its forthcoming Surface tablet, which combines touch and pointer-based input systems? Not likely.

Remember that the core of Apple's thinking with the iPad was that people wanted to interact with tablet computers in different ways to how they interact with a mouse pointer. That, Steve Jobs believed, was why tablet computers hadn't been terribly successful in all the years they'd been available. The success of the iPhone and iPad has pretty well vindicated that logic and it's unlikely Apple is thinking of making one OS run on all its devices now.

It's more likely that Apple is trying to make the differences in user experience between its two OSs smaller than they have been, so Windows users who buy an iPad and then think maybe they might like to look at a Mac will find themselves on familiar ground, not having to learn new things all over again.



Photos you take in Photo Booth can be sent straight to other Macs on your network via AirDrop, or shared with online services, all from right within the app.

More than just email and calendars now, Apple's online services are integral to the new operating system.

of this and – for the first time – to be seen to be getting out in front of it. Pretending security is something Windows users have to worry about is no longer going to work.

ICLOUD: IT'S EVERYWHERE

iCloud is Apple's current name for its suite of online services. It's a direct descendant of iTools, which dates back to 1998. That was replaced by .Mac in 2002 and MobileMe in 2008. But it's more than simply renaming.

The difference, of course, is iOS. Where iCloud's antecedents were basically non-essential add-ons to your Mac-using life, iCloud's *raison d'être* is keeping everything synchronised between the multiple devices that just about everyone has these days. Your Contacts, Calendars, Mail, even your bookmarks and the tabs you're reading in Safari can all be synchronised between your various devices without you having to do anything.

The major change to iCloud for Mountain Lion is Documents in the Cloud, whereby documents you create in iCloud-enabled applications are saved automatically in iCloud and updated on every device on which you run that application. First is obviously Apple's own productivity applications such as Pages, although the API is available to third-party developers. Anyone who wants to create OS X and iOS versions of their applications and keep documents automatically updated between them, can do so.

You'll be able to save files just as you always have, into folders on your hard drive, even in iCloud-enabled applications. However, from now on you'll have to make the explicit decision to do so. Documents saved in that way naturally won't retain all the various advantages that iCloud offers.

iCloud isn't exclusive to Mac users, either. Apple provides an iCloud control panel for Windows, so Microsofties with iPhones and

iPads can keep their mail, contacts and calendars synchronised between their mobile devices and Windows. At this stage it's not clear how much support, if any, will be available for documents and data in iCloud for Windows users – most likely that aspect of iCloud will remain Mac-only.

Why does this matter? iCloud is essentially becoming a file system separate from the Mac's native file system. Where previously you saved a document or an image or whatever into a folder on the hard drive where any application capable of opening it could do so, saving things into iCloud means only the application used to create a document can open it. Anything else – including any malicious software out to wreak havoc on your Mac – can't even see it, much less edit it.

That's right, it's a security feature. Didn't I say Mountain Lion was all about security?

Of course, you can get around this using the 'Open with' command, much as you find on iOS devices. But doing so means you're explicitly telling the system it's OK for another application to open the file. It can't be done without your permission.

OTHER COOL STUFF

NOTIFICATIONS

No more calendar alerts that won't go away until you click on them. In Mountain Lion, you get a small visual alert box that disappears after a few seconds, but then at any time you can swipe with two fingers from the side of your trackpad and the desktop will slide sideways to reveal the Notification Center. Here, calendar alerts, new email, Twitter mentions – any app that you allow to give you notifications – can be listed waiting for your action. In a few months support will be added for Facebook as well, so you'll be able to keep up with conversations there on your Mac just as you do on your iPhone.

Unlike its iOS equivalent, the OS X

Notification Center doesn't have live updates like a stock ticker – that's still in the somewhat neglected Dashboard, at least for now.

DICTATION

It's not quite Siri yet – then again, Siri isn't quite Siri yet – but Mountain Lion includes system-wide speech recognition. Wherever you can type, you can choose instead to dictate what you want to say. It's actually fairly reliable for a speech recognition system. For instance, I dictated this entire paragraph using it (with just minor corrections).

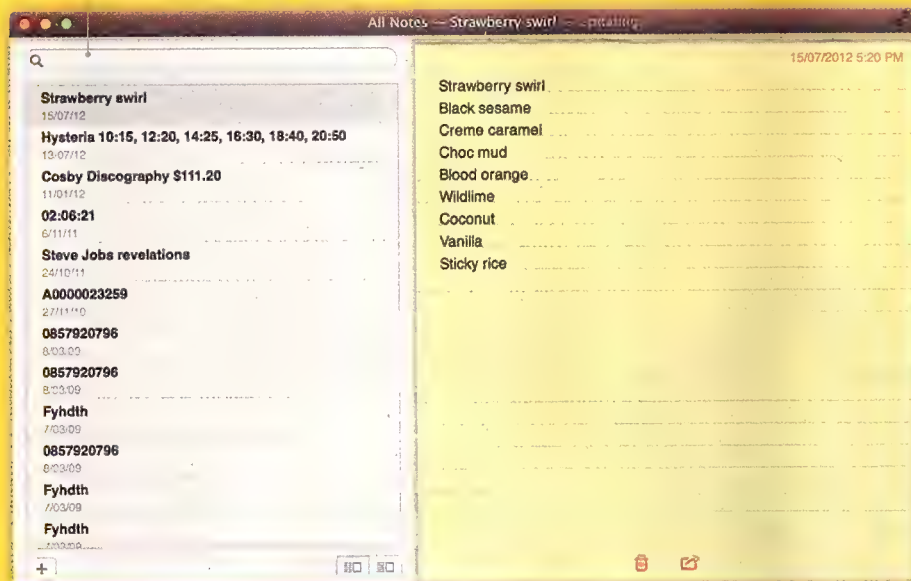
SHARING

Social networks are ubiquitous in the real world and no less so in Mountain Lion. As well as being able to Tweet straight from the Notification Center, you'll be able to post to Twitter, Flickr, Vimeo and (in a few months) Facebook directly from many apps such as Safari, Photo Booth, Notes, iPhoto and others. This is also a feature that Apple has made available via an API to third-party developers, so expect to be able to post to your chosen sharing site from just about any relevant app before too long.

CHINA

OK, China isn't actually a feature of Mountain Lion. It's a country. A big one, with lots and lots of people. And the thing with those lots and lots of people is that they largely aren't using the English language and its many and varied typefaces, nor are they interested in a lot of the same social networking sites that English-speaking users spend their time with. Mountain Lion includes eight fonts for Chinese writers, plus improved support for handwriting recognition for Chinese character input. Support for Chinese online services such as QQ, Sina Weibo and Baidu is embedded just as deeply as Twitter and others are for the English-speaking world.

There's no reason for this notepad to look like I've clumsily torn pages out of it, except to irritate me. I'll bet even Steve Jobs's real-life notepad didn't have scraps of torn paper hanging from it.



STILL NEEDS WORK

In case you're thinking that perhaps Apple has achieved some kind of OS nirvana with Mountain Lion – that it's an unsurpassable perfection of user experience, form and functionality – allow me to disabuse you of that silly notion.

For a start, the faux-leather effect on iCal and the Address Book that first appeared with Lion remains in the Mountainous version, despite the applications' new names and some other interface refinements. The new Notes application brings its own 'fake real' effect with a torn paper flourish at the top of every single note. It's not attractive and it's not productive.

My major bugbear with Mountain Lion is the same one that's bothered me with every version of Mac OS X to date and that's the fairly arbitrary placement of various preferences. For instance, if you want to decide what types of volumes (hard drives, optical disks, servers) appear on the desktop, you might think that this would be in the 'Desktop' pane of 'System Preferences' – but no. Because Apple treats the Finder as an application somehow separate from the OS, despite the fact that the system can't operate without it, you find that setting under the Finder's own 'Preferences' menu.

Meanwhile, if you want to set something other than Safari as your default web browser – a system-wide setting, one would imagine – you'll find that setting in Safari's preferences. That's right: you need to run Safari in order to tell your Mac you don't want to run Safari.

And if you need to add a new email account, you can do that where you always have, under 'Preferences' in Mail. But you can also do it under the 'Mail, Contacts & Calendars' pane in 'System Preferences', new to Mountain Lion. Having more than one way to do things is fine, but more than one place to change the same settings is just a recipe for conflicts. Indeed, in upgrading to Mountain Lion I encountered a problem with one of my accounts because the settings in one place didn't match the settings in the other place.

Speaking of default applications, it's nice to be able to post to Twitter from just about any application, and being able to write a tweet straight from the Notification Center without even opening an app is nice, too. But if you're notified about a tweet that mentions you and you click on it to reply, it opens Safari (or your default web browser) and logs in to Twitter to do so. If there's a way to tell it to open your preferred Twitter client instead, I've been unable to find it.

Finally, there's multiple-display setups. Once a rarity and the exclusive domain of power users, they're increasingly common in these days when most people are buying portable computers and hooking up to a bigger display at home and/or in the office. Key features such as full-screen apps and Spaces (which allow you to maintain several virtual desktops for different applications) simply don't cope with them. Spaces in particular becomes confused to the point of being virtually useless once you invoke a full-screen app.

At least Mountain Lion allows an app to go full-screen in whatever display its main active window is using – an improvement over Lion, which would only use the primary display, even if that was the 11in MacBook Air sitting next to your 30in Cinema Display. But more needs to be done. We power users want to use our screen real estate. **apc**

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FBI USE

ORIGIN

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THAT INFORMATION IS

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USB KEY BETTER THAN CLOUD

Until fast internet access becomes universal, USB keys are the answer.

The Cloud is getting plenty of hype in *APC* and other magazines recently. It might be useful if we had fast internet connection available everywhere, but we don't.

I work in many places where the PCs do not have internet access or where wireless internet access on my laptop is unavailable (for example, hospitals, because of interference it causes to other equipment).

The solution? Nothing beats the USB flash drive. It's attached to my keys and goes everywhere with me (and I don't have to carry around my laptop). With 64GB USB drives now available, you can carry nearly all your documents with you.

So with my USB drive, I can use any PC to work on my documents or train people using their equipment. Microsoft's free SyncToy keeps my documents in sync with the office and home PCs, and I have it password-protected by USB Secure. It's also handy as a backup for my files in case of hard disk failures and so on.

So until fast internet access is available everywhere, I'll stick with this 'old technology'.

It's a pity SanDisk's U3 is no longer supported – it did all this as well as being able to carry OpenOffice.org and other software.

Mark Green
from the internet

LINUX NOT LAME

I disagree that 'Linux is lame' and is 'an OS that's going nowhere' as John Randall put it in your August issue. Your statistics about desktop use are correct, but I feel you might be missing the bigger picture. Linux is here to stay. It's on phones and tablets (Android), desktops, servers (Linux has a larger share of the web hosting industry) and is even running some in-car computers nowadays.

Windows has had its place in the market since the dawn of end user computing, but Linux has always been there in some form. People choose Microsoft because it's familiar and very few vendors offer a Linux OS on desktops and laptops.

How often do you see a TV ad, billboard or bus advertising Linux? I'm guessing rarely because it's free, open source and community-driven, meaning no massive headquarters somewhere with a budget to spend on advertising.

It's thanks to magazines like *APC* that not only distribute Linux, but market it as well by using valuable cover space to put the Linux name on the newsstands. They even go so far as to provide easy-to-follow instructions for users who want to trial Linux without leaving the security of Windows for something new. Some programs come with a Linux version; for example, Skype, a Microsoft-owned company, also comes in a Linux version. Linux is a niche market, but is slowly becoming mainstream through channels such as *APC*.

Alek Patsouris
Concord NSW

OS IS LIKE A PAIR OF UNDIES

I was stunned to read the comments in August *Epinions*, 'Linux is lame'. I thought the Windows vs Linux angst was done and dusted. However allow me to settle this once and for all.

It's not about which OS is better or more popular, it's about what meets a user's requirements. Keep an open mind about which OS you choose to install and use what best fits your needs. Windows does gaming and a few other things for me, and Linux fills the needs that Windows can't – they both have a firm place in my network.

At the end of the day an OS is like a pair of favourite undies that fit well, are comfortable and do what you want them to. Windows or Linux? They're both good, so it's time to crack on.

Steve
ACT

LINUX COVERAGE IS GOOD

There were a couple of complaints in the August issue about *APC* having too much Linux coverage – all I can say is I'm sorry I missed it! *APC* does a great job in balancing coverage of all OSs. I personally use Ubuntu, Windows 7, Windows Server 2008, iOS and Android every day, so it's great to have found *APC*.

David Vesely
Bangkok

EPINIONS@APCTEST.COM

Come on, have your say!

We want to hear what you think. Add to these discussions or email your views (in fewer than 250 words) to epinions@apctest.com. All correspondence becomes the property of *APC* and is subject to editing. Letters must include full name, street address, suburb, state and phone number to be considered for print publication. Address and phone details will not be published.



ANDROID PROMISCUITY

Android end users are more likely to have sex on their first date, according to one of many questionable surveys.

Just as the personal computer divided its audience into tribes, such as PC and Mac users, the smartphone is doing the same thing, and every market research company and ecommerce site is trying to define their characteristics. We looked at recent surveys of smartphone users and came up with the following generalisations.

ANDROID USER

You are more promiscuous than users of iPhones or BlackBerries. According to a survey by Match.com, 62% of singles who use an Android device are likely to have sex on their first date, compared with 57% of iPhone users and 48% of BlackBerry users.

Personality-wise, you're more likely to be a pessimist, according to Hunch, a web service that tracks what people recommend on the net. When it comes to art, you have edgier tastes than iOS users, you're more likely to appreciate

street art and surrealism; in terms of theatre it's Shakespeare, Cirque du Soleil and contemporary stuff.

You're more of a cheapskate than iOS users, which should make you less attractive to developers of mobile apps and advertisers. This is backed by two surveys. The first, by comScore, a digital analytics firm, showed that only 24% of Android users are likely to access retail content via their apps, compared to 36% of iOS users. The second, by Jumtap, a mobile advertising company, says you're also less likely to click on mobile ads, with pathetic click-through rates ranging from 0.4% to 0.5%.

Your taste in tech is geeky – you tend to like ugly devices that are full-featured and versatile.

IOS USER

While you're less likely to have sex on your first date, as an iPhone or iPad user you're more likely than an Android or BlackBerry user to date someone at work (or have an

affair). According to Match.com, nearly one in four iPhone-owning singles have had an office romance. That's a high number and maybe it's because you're optimistic by nature (compared to Android users), a quality that's desirable in the workplace.

As an iOS user, you're more likely to buy paid apps and click on ads than an Android or BlackBerry user. Jumtap examined click-through rates for various ads and found that they were much higher on both the iPhone (0.84%) and iPad (0.9%) than on any of the Android devices.

As an iOS user, you're likely to appreciate minimalist art, abstract impressionism and the Bauhaus school. You enjoy Broadway musicals, classical plays and dance; a more low-brow selection than Android users.

When it comes to tech you're more likely to appreciate sleek devices that do a few things well. Unlike Android and BlackBerry

users, you also have much more faith in the maker of your smartphone as a good investment.

SigFig, a startup investment site, found that iOS users are more likely to invest in Apple shares than Android users in Google or Android companies. According to SigFig, up to 16% of iPhone users have shares in Apple. However, only 4% of Android users have shares in Google.

BLACKBERRY USER

There's less information about BlackBerry users, but we know from the Match.com survey that you're more likely to drink alcohol on your first date.

Probably as a result of the alcohol, you're also more likely than users of other platforms to claim you've experienced love at first sight.

As a BlackBerry user, you have less faith in RIM as an investment, with only 1% of BlackBerry users owning shares in RIM.

ENDUSER

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Do you work in the IT industry and are forced to deal with inept and clueless end users on a daily basis? Do you have an IT professional, who isn't that 'professional'? If you have an interesting or amusing story, email us at contact@apctest.com. All correspondence becomes the property of APC and is subject to editing. Letters must include writer's full name, street address, suburb, state and phone number to be considered for print publication. Address and phone details will not be published.

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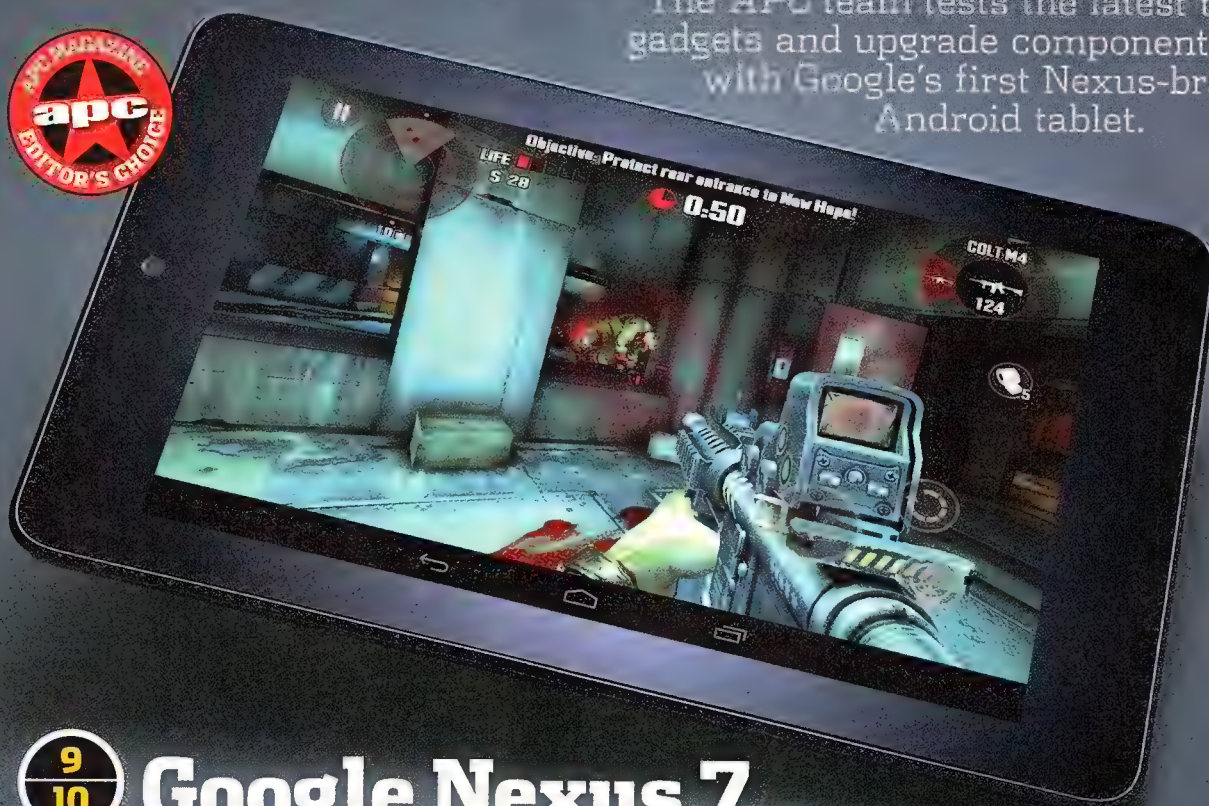


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GOOGLE STRIKES BACK

The APC team tests the latest tech gear, gadgets and upgrade components, starting with Google's first Nexus-branded Android tablet.



9/10

Google Nexus 7

High quality at a low price? What's the catch?

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8GB, \$249; 16GB, \$299 \$
(plus shipping)

Fantastic specs at a low price, great for entertainment use, strong dev community support. ✓

No microSD slot, screen contrast could be better. ✗

Android tablets are in trouble. While there have been a few standouts – Samsung's Galaxy Tabs and ASUS's Transformers have had fair features and quality – high pricing has tarnished the lustre of most offerings and seen them struggling to win any ground from Apple's iPad. Since the start of the year, Apple has increased its global tablet market share to 62%.

Even one ray of light – Amazon's US-exclusive, bargain-priced Kindle Fire – likely did Android more damage than good. Although the Fire sold big initially, it tanked in its second quarter and Amazon's walled-garden approach has only widened the fissures in the fragmented Android market.

Google needs to do something and its first shot is this low-cost Nexus 7 – and it's really Amazon, not Apple, that's the target. From both a size and weight perspective, the Nexus 7 is essentially the mass-market paperback of tablets – a smaller, cheaper and more tote-able alternative to the 'hardcover' 10in tablets. It's a 7in model that seeks to be a better (and international) version of the Kindle Fire.

It's very hard to fault, especially if you're primarily looking for an entertainment device. It's flexible and well kitted out for most activities, thanks to a gutsy Nvidia Tegra 3 chip, with enough grunt for any current task, be that casual or hardcore gaming, streaming videos, listening to music, reading ebooks, web surfing or video chat via Google Talk. The new Android 4.1 (aka Jelly Bean) is likewise a fast and slick experience, adding

small tweaks across the OS to improve general usability. And despite some criticism of the Nexus's 1,280 x 800-pixel IPS screen, which could have better contrast, its clean and clear rendering still punches well above the \$300 price. It's also comfortable to hold one-handed, and the slightly rubberised back and low weight (340g) make it easy to use for prolonged periods. The lack of a rear camera is a slight shortcoming, but more annoying is the lack of a microSD slot to add storage – even the larger 16GB model doesn't leave much room for movies and games. 3G or 4G connectivity would likewise be nice, but with Wi-Fi smartphone tethering now commonplace, it's again a limitation most people will be able to forgive.

The Nexus 7's productivity chops are a little less robust, however, mainly due to the size. In landscape orientation, the onscreen keyboard isn't quite big enough to use two-handed, yet it takes up around 75% of the display. Portrait mode works better for text entry, but the requirement to thumb type doesn't make it much more efficient than using a smartphone.

From a tinkerer's standpoint, the Nexus 7 is being warmly embraced by the Android developer community, with the ever-popular CyanogenMod custom OS already available. This is without doubt the best-value Android tablet yet. If Google can release a keenly priced 10in version, as is rumoured later this year, it might even make a dent in the iPad problem.

Dan Gardiner



6/10 Samsung Galaxy Tab 2 7.0

This dinky device is vying for the mini tablet crown.

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Feature-filled, nice size, ✓
lightweight, microSD. ✓
Mediocre processor, ✗
lacklustre panel, average
battery life.

The Samsung Galaxy Tab 2 7.0 is a solid 7in tablet that includes all the features you'd expect in a top-end device for a wallet-friendly price.

The Galaxy Tab 2's chassis is silver and has just three buttons at the top-right for wake/sleep/power, plus volume adjustment.

The Galaxy Tab weighs 344g and feels light in the hand. To put these numbers into perspective, it's just over half the weight of the new iPad, but only fractionally lighter than the Motorola Xoom 2 Media Edition, which manages to pack in an extra inch of screen real estate at 8.2in.

The smaller size makes it easy to read one-handed, which is great for commuters – it especially helps if you missed out on a seat – and, we're assured, parents who want to read while holding a small, wriggly child.

Inside the Galaxy Tab 2 you'll find a TI OMAP 4430 dual-core processor clocked at a rather pedestrian 1GHz. We're used to seeing beefier processors now and many manufacturers are looking to the quad-core Nvidia Tegra 3.

That said, there should be enough speed to power the smaller 7in tablet through most tasks.

The processor is backed up by a healthy 1GB of RAM, so no scrimping there, and an interesting lineup of storage sizes. The Galaxy Tab 2 7.0 is available in 8GB, 16GB and 32GB versions, making it a truly budget option. You can add to the storage with a microSD card up to 32GB in size, so the 8GB version won't restrict media lovers too much.

The 7in screen is a 1,024 x 600 TFT affair, but the panel itself is lacklustre, lifeless and dull, which won't impress movie lovers one bit.

The onscreen keyboard is especially good for such a small display, and we liked the positioning of the numeric buttons across the top. Typing was accurate and we were able to quickly tap in passwords, URLs and emails without getting frustrated – something that can't be said for some 10in models.

Navigation through the screens, apps and operating system was nice and quick, with none of the noticeable lag

that used to plague Android tablets. We lay the praise at Ice Cream Sandwich's door for making better use of the dual-core chip held within.

The battery life of the Galaxy Tab 2 7.0 was distinctly average and the tablet scored a mediocre 305 minutes in our stress tests. This involved streaming a looping, high-definition video from YouTube. We found that the battery drained fast, so you'll need to charge it every couple of days.

Books were easy to read and the Reader's Hub provides Kobo and Zinio integration. The words were easy to read and it was comfortable to hold and navigate, making it one of the best ebook tablets, but still no match for E-ink devices like the Amazon Kindle.

If the idea of a portable, fun and comparatively low-cost tablet appeals enough for you to part with \$265, this is your device. However, if you strive for the best experience, the sharpest screen and the most slender build, you'll see that Samsung has cut corners with this device.

James Stables



9 10 Dell XPS One 27

Where's the Apple logo?

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Rather pricey, no
touchscreen. ✗



'If you can't beat 'em, clone 'em' seems to be the mantra behind this stunning 27in all-in-one PC design. With Apple's iMac continuing to sell like hotcakes, we can forgive Dell for crafting its premium all-in-one in the same form as Apple's trendsetter. The iconic aluminium body and stand has been replicated, but Dell has chosen to make the border of the screen black plastic rather than shiny silver.

The front of this PC is dominated by the edgeless 27in display. Built by Samsung, the screen uses PLS (Plane to Line Switching) technology to deliver rich colours and stunning brightness over a wide viewing angle.

With a resolution of 2,560 x 1,440, individual pixels are hard to spot and we were constantly impressed at the crisp image quality. Dell has cleverly included a Blu-ray drive to take advantage of the beautiful screen, and the built-in stereo speakers were surprisingly capable of delivering clear movie audio, even at louder volumes.

However, given the impending release of Windows 8, Dell's decision to exclude touch functionality is nothing short of boggling. When paired with the new Metro interface, a touchscreen would have been a hugely compelling option for those torn between the iMac and the XPS One 27. Instead, Dell has

bundled a rudimentary wireless mouse and keyboard with the PC, neither of which are anywhere near as cool as the iMac's magic trackpad.

Perhaps Dell decided the hardware inside would be reason enough to consider this all-in-one. The powerhouse buried within the slim case, which varies between 32mm and 72mm, is Intel's new Core i7-3770S. This quad-cored, Hyper-Threaded processor is basically a power-tuned version of the i7-3770K and with a maximum TDP of just 65W, it's perfect for the thermally challenging conditions found inside a stuffy all-in-one chassis.

It accomplishes this by dropping the base frequency to 3.1GHz and then limits the maximum Turbo speed of 3.9GHz to just a single core.

Dell has paired this potent CPU with Nvidia's new GT 640M GPU, an extremely power-efficient GPU designed for laptops. As expected, it's not quite powerful enough to run games at

1080p, let alone this PC's native resolution, but dropping the screen down to 1,280 x 720 (720p) should deliver a smooth experience. Running 3DMark 11 in the 720p Performance mode, this PC scored a respectable P1967 points, proving its chops for occasional gaming performance.

Overall system performance was much more impressive, though, thanks to the combination of the speedy CPU with 8GB of DDR3-1600 RAM and a Samsung 32GB SSD used for caching.

Our PCMark Vantage benchmark score of 11,495 PC marks makes this all-in-one around 15% faster than the next closest, and is reflected by the system's excellent response in day-to-day tasks. Surprisingly, the machine remained relatively quiet during all of our benchmarks.

While the lack of a touchscreen is a glaring omission, Dell has set a new benchmark for all-in-one performance and screen quality with the XPS One 27. Obviously, the price reflects the quality of the components used within, but those looking for the ultimate in slim Windows-based computing will find very little to complain about with this beauty. Whether Apple will complain about the borrowed styling is another thing entirely...

Bennett Ring

TEST RESULTS

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x264 HD Benchmark Pass 2	38fps
3D Mark 11 performance mode	P1967
PC Mark Vantage	11,495 PC Marks

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6 10 Alienware M14xR2

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Gaudy looks, poor battery life. ✗

Not so long ago, Alienware was one of those few niche vendors that could be relied upon to produce a decent portable gaming laptop. In the days before Intel's Ivy Bridge and Nvidia's Kepler processors, that was something of a rarity. The selection of 'gaming laptops' from most vendors comprised an unappetising menu of hulking desktop replacements and underpowered (but realistically mobile) systems. Indeed, the sweet spot between performance and portability was so small that it was really only dedicated gaming houses or vanity wings of larger vendors like Alienware's parent company Dell that cared to produce a compelling compromise.

Though to be fair to the less capable brands, that exclusivity did tend to have its drawbacks. Good luck finding a two-year-old gaming laptop that doesn't look like a prop from *The 40-Year-Old Virgin* – gaudy lights and tough decals were, and remain, a baffling trapping of many of the dedicated gaming machines.

We shouldn't have to tell you that the laptop landscape has changed substantially in past months, however. Thanks to powerful yet efficient parts like Intel's latest CPUs and Nvidia's surprisingly frugal Kepler graphics chips, even the squarest laptop vendors are producing gaming powerhouses. And that's leaving the likes of Alienware in an unfortunate spot. When even typically straight-laced HP is producing great media laptops, what does Alienware have to offer aside from ostentatious lighting?

We're not entirely sure. To be honest, while the M14xR2 is no slouch – a Core i7-3720QM processor and GT 650M Nvidia GPU ensure solid frame rates at its native 1,600 x 900

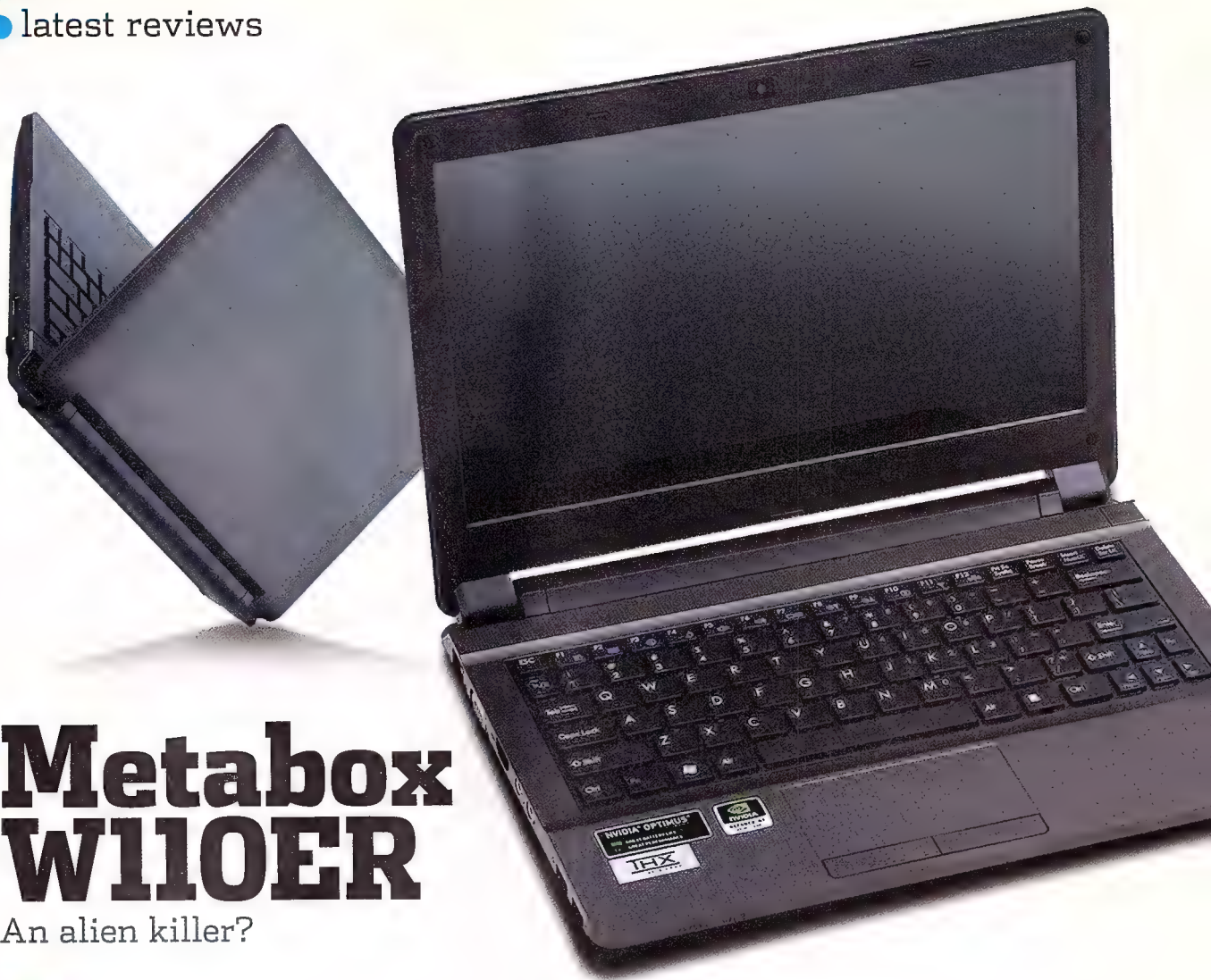
resolution – neither is it a standout. It's hard to complain when it can run *DiRT 3* smoothly at its highest quality settings, but that's no longer a herculean feat. Synthetic benchmarks tell the same story: this laptop's PCMark and 3DMark scores are solid at 4,300 and 3,736, but they're what you'd expect for two grand nowadays.

What we can complain about is poor battery life – 2.5 hours is pretty paltry for an Ivy Bridge laptop, especially when HP's similarly priced and better spec'd dv7-7008tx can boast around an hour more. And we can also take issue with the M14xR2's notably cool screen. The 1,600 x 900 panel here is quite clear and contrasty with good viewing angles, but colour balance is so drab that even the most action-packed gaming is a curiously subdued affair.

At least the audio is good – the relatively thick chassis lends its speakers plenty of reverb room, making for laptop audio that's less tinny than many competitors.

Then, of course, there's the design. At almost 3kg, this is quite heavy for a 14in laptop and that weight translates to a chunky look overall, which isn't minimised by Alienware's requisite LED backlights and branding. And therein lies the rub. The M14xR2 isn't far off the pace in terms of gaming power for the price. We can deal with the blueish screen and the components here are quite powerful overall; however, this a bit of a throwback in terms of looks and attitude. It used to be that investing in portable gaming power meant accepting the aesthetics of arrested development, but with more visually subdued and, dare we say, mature options available now, the M14xR2 is a bit of a niche offering.

Dominik Krupinski



8/10 Metabox W110ER

An alien killer?

LAPTOP

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Absurd power to weight ratio, generous physical connectivity, comfy rubberised surfaces. ✓

Lots of plastic, slightly cramped keyboard, CPU throttles during gaming, poor battery life. ✗



On paper the Metabox W110ER sounds too good to be true. It's described as being almost as small as a netbook while having insides comparable to a heavy gaming laptop. That description is wholly accurate in reality, too: it's monstrously powerful, despite weighing only 1.8kg and having a tiny 11.6in screen. It's tantalisingly close to perfection if you're after a portable gaming powerhouse.

It uses a full-voltage third-generation Intel Core i7-3610QM together with an Nvidia GeForce GT 650M and 8GB of DDR3-1600 RAM. Remember, this is in a laptop under 2kg. It also has a 128GB SSD and those specs resulted in a fairly mighty PCMark 7 score of 3,989.

But synthetic benchmarks are only one side of the coin. We booted up *Battlefield 3*, set it to Ultra and proceeded to shoot a lot of rounds. It ran smoothly pretty much the entire time. Because the screen is comparatively small, it also looks a lot better than the 1,366 x 768 resolution might suggest.

There was one strange quirk while gaming, though. The CPU is able to boost up to 3.3GHz, but when playing

Battlefield 3 it never got above 2.3GHz. Interestingly, the CPU temperature stayed around 80°C, nowhere near temperatures normally associated with throttling. While rather warm when gaming on a lap, it was nowhere near as hot as the Acer Aspire Timeline Ultra M3 (reviewed in APC August, page 56).

For portability, the W110ER has every gaming laptop beat. It weighs only 1.8kg and while it's on the thicker side at 37mm, the overall size is still really small. Unfortunately, the battery life of the Metabox W110ER was lousy.

On Powermark's entertainment benchmark, it scored about 1.5 hours, which is quite a bit lower than other third-gen Core i laptops we've tested.

Physically, while the chassis of the Metabox W110ER is entirely plastic, the screen backing and keyboard deck have a comfortable rubberised finish, though the underside and screen surrounds feel comparatively low-rent.

The glossy 11.6in screen's colour vibrancy was fine, but the viewing angles are only average and we do wish the screen tilted back more to make lap usage more comfortable. While the keys have a nice amount of travel and

feel decently springy, each key is a bit too small for comfort. There's definitely the space for a larger keyboard, so it was a pity to not see it used effectively.

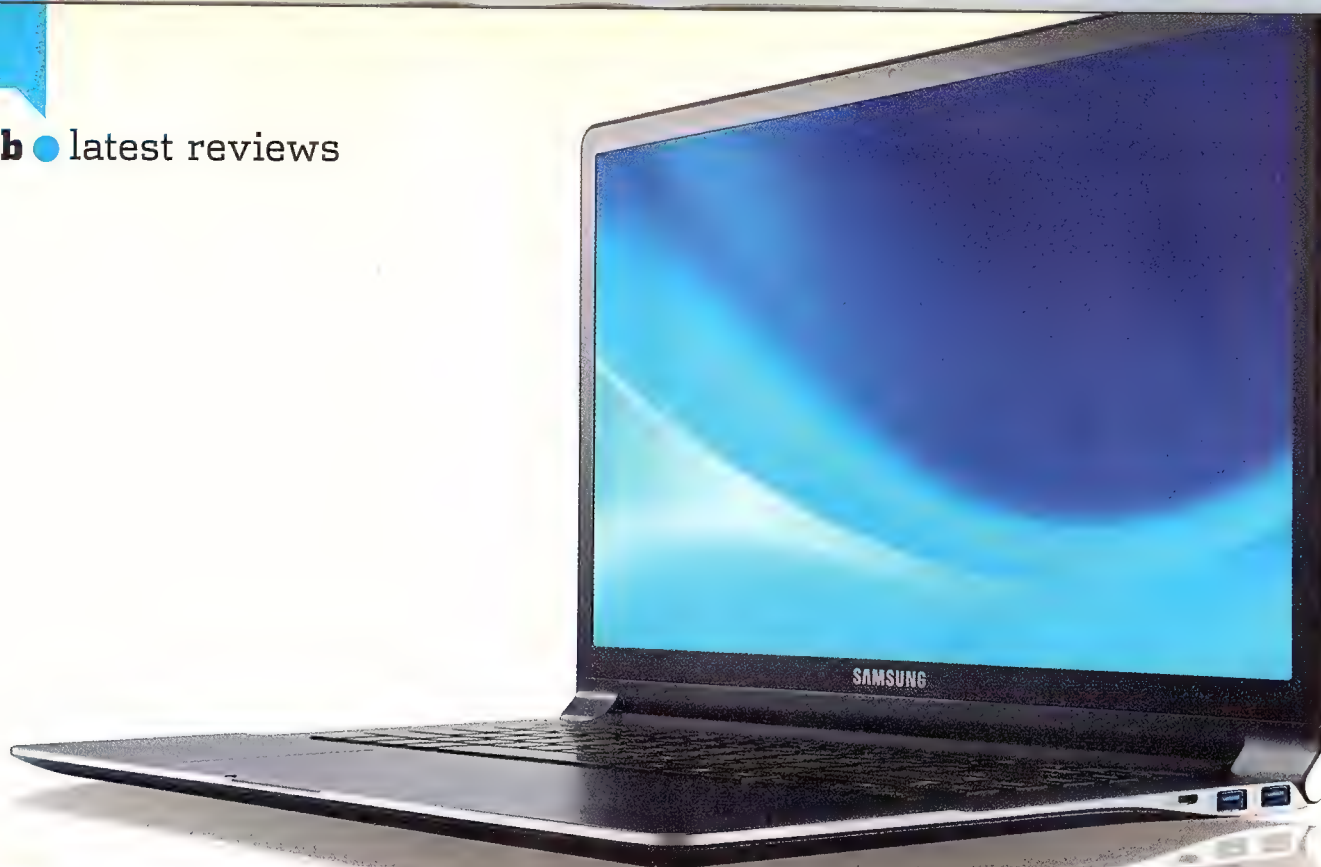
The touchpad of the W110ER is pleasant to use, with reasonable sensitivity and gesture support.

The speakers are loud, but can distort at certain frequencies, producing a crackling sound. While the webcam recorded acceptably smooth 320 x 240-pixel footage, the recorded sound was very quiet.

Despite the small size, the physical connectivity is great. It has HDMI, two USB 3.0 ports, one USB 2.0, plus VGA, Gigabit Ethernet, headphone and microphone jacks, as well as a nine-in-one card reader.

Overall the Metabox W110ER is a real feat of engineering. Yes, the build quality could be improved, the battery life needs a boost and we'd prefer if the CPU wasn't throttled during gaming, but the proof is in the gaming. Delivering smooth performance with *Battlefield 3* on Ultra is a major step forward for sub-2kg portables.

Conrad Bem



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You've gotta hand it to Samsung, the vendor's taking the Apple chase seriously. Of all the competitors in the consumer technology race, we think Samsung is the one that most consistently nips at Apple's heels and sometimes gets ahead. (We think the iPhone 5 will have to be pretty special to completely outdo Samsung's latest smartphone, the Galaxy S III.) Bearing in mind that our current Intel laptop of choice comes from ASUS – the excellent UX31A – this is another strong showing from Samsung. The NP900X4C is one of those still rare beasts – a 15in ultrabook – and we think that it offers further evidence of Samsung's ambition to become the equal (or envy) of any hardware vendor.

There's no two ways about it, this is a sexy machine. And gratifyingly, it's not sexy in a consciously imitative way. While the ultrabook category of laptops on the whole can arguably be seen as a cynical adoption of Apple's industrial design, the sharp edges and distinctive curved hinge here are Samsung all the way. It's the sort of considered design statement we've come to expect from the Korean vendor. Between the Series 9's rigid, lightweight duralumin shell, razor-thin profile and understated yet distinctive slate blue aesthetic, this really looks like no other laptop currently on the market.

It also helps that the screen – a matte panel, no less – also makes a good first impression, with bright, clear images being the order of the day. However, unfortunately, the twisted nematic technology means effective viewing angles are quite small on the whole – if you're not looking at this screen from just the right position, it can look a bit subpar.

The NP900X4C also impresses internally, though perhaps not to quite the same degree. Unlike smaller ultrabooks, which can get away with fairly sparse features, a 15in laptop like this does have to offer concessions to users who want

a desktop replacement. And there the NP900X4C both hits and misses. The bad first: despite this being a larger machine (and it's really a little too large to pass as a travel laptop), connectivity is in keeping with the sparseness of smaller ultrabooks. Three USB ports (two USB 3.0), an SD card slot, mini-VGA, mini-HDMI and adapter-requiring Ethernet comprise the entire complement of inputs and outputs here, whereas for a machine this size, we'd like to see at least full-size HDMI.

Storage is also an issue – the default configuration is a single 128GB mSATA SSD and for a potential desktop replacement, that's pretty tight-fisted.

Fortunately, popping open the rear panel we found that both memory and storage do seem to be user-upgradable, with neither component being soldered onto the motherboard. Keeping in mind that larger mSATA SSDs are still a bit of an expensive rarity, that does at least mean that the limited storage isn't a total deal-breaker.

Otherwise, thanks to a Core i7-3517U CPU, ample RAM and SSD storage, the NP900X4C is a snappy performer. Its PCMark 7 score of 4,585 is at the higher end of consumer laptop scores, and that's reflected in a butter-smooth desktop experience. Intel's HD4000 integrated graphics actually do a good job of affording the NP900X4C some casual gaming chops, too. We found *DiRT 3* very playable at this laptop's native 1,600 x 900 resolution, albeit only at low settings.

All in all, though we'd have preferred more storage and perhaps a higher-resolution screen, this is an excellent offering from Samsung and one of the better put together and more distinctive thin and light laptops around. It's a pretty compelling product.

Dominik Krupinski

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8 10 Western Digital My Net N900 Central

The first router with an inbuilt hard drive.

ROUTER

www.wdc.com @

\$400 \$

Very simple administration, combo NAS and router, top-speed local networking. ✓

Relatively weak NAS features compared to a dedicated device, that price. ✗



Western Digital surprised a lot of people recently when it announced it was entering the router business. After all, what could the hard drive manufacturer bring to an already crowded market?

Integrated storage, for a start. Most of the new WD My Net routers are fairly conventional, but the N900 Central features a built-in hard drive, turning it into an effective network-attached storage (NAS) device. That's something that a number of other routers can accomplish as well, but they require an external USB hard drive.

We tested the N900 Central 1TB version using simple file copy tests, with files both large and small, over a Gigabit Ethernet network. In our tests, we compared it to an internal hard drive, a Linksys E4200 router with attached USB drive and a low-cost dedicated NAS, the four-bay QNAP TS-412. As expected, the internal drive smoked it, but it also fell well short of the QNAP. Still, it handily outperformed the Linksys, showing that there is some benefit to having an internal drive. The N900 Central also has a USB 2.0 port in case you want to expand its storage quota in the future.

In terms of networking features, it's fast – as fast as money can buy, which is good, because purchasing this router requires a lot of it. It features dual-band 450Mbps wireless and Gigabit on all wired ports (four LAN and one WAN). It has no ADSL modem, so you'll need to bring your own if you use the latter. At 10m, through two plaster walls, the router maintained a healthy wireless signal strength when we tested it. At that range, over a 10GB file transfer with a 450Mbps wireless adapter, it maintained an average speed of 6.1MB/s in the 2.4GHz band, which is more than enough to support

HD video. At 5m it hit 13.1MB/s. That was 0.7MB/s and 3.1MB/s (respectively) slower than a Netgear WNDR4500 tested the same way, but still solid.

The admin interface is both excellent and frustrating. It's super-simple, largely designed for beginners. It does make it very easy to get the router up and running, though, and is definitely a fresh take on router administration. The integration with the WD 2go service, which allows secure remote access of files stored on the device, is also quite nifty.

But for advanced users, deeper settings aren't just hidden – they're inaccessible. Forget about things like user groups for shares, folder security settings, advanced QoS settings and fine firewall controls.

We found this out the hard way when our test PC running Windows 7 Home Premium refused to acknowledge the existence of the network share. Even though we could see the router, we couldn't access the shared folder through standard Windows File Sharing/SMB. Trying to access the SMB settings on the router proved impossible. It turned out to be a Windows 7 problem – eventually Windows decided to install drivers for the My Net and everything started working fine, but the inability to control or even see SMB settings to diagnose the problem was a major pain.

Aside from those frustrations, however, the WD My Net N900 Central is a fine product: a unique combination of router and NAS. It's not a particularly strong NAS, but it's clearly better than most routers at the task. It is a very fast router, switch and access point, and it's simple enough to not scare the heck out of your non-technical parents.

Nathan Taylor

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X10

6/10 Sony Xperia P

A weird mix of cutting-edge and yesterday's technology.

SMARTPHONE

www.sonymobile.com @

\$449 \$

NFC, much better touchpanel than Xperia S, good screen. Still on Gingerbread, no expandable storage. ✓ x

The Xperia P looks a lot like the more expensive flagship Sony Xperia S, albeit in a smaller form factor. One annoyance Sony's ironed out in the P that's present in the S is the transparent panel that houses the button icons; on the S that's not where you tap, but the P will accept a tap from anywhere, making it much easier to quickly and accurately use.

Like the Xperia S, the P also supports NFC (Near Field Communication) and comes with tags in the box, which allow for setting up application profiles and automatic actions, and work very well with the included tagging application. The Xperia P also has what Sony calls a WhiteMagic screen that (so Sony says) presents better imagery in direct sunlight. It's a big claim, but one that's backed up in testing – we've never seen a screen that looks this good even directly under the sun.

This is still a mid-range performer – it got an average 2,123 Quadrant score and 50.2fps in Neocore – and is hampered by Sony's use of Android 2.3 on the launch models. It's promised it'll be upgradable to Ice Cream Sandwich within a month or so of launch, but that's still disappointing.

For everything the P does right, there's an equal something it does wrong, or at least in a mediocre fashion, and that makes it a tough phone to recommend. On plans, you could do much better and even outright there are better bargains, unless the lure of NFC really grabs you.

Alex Kidman



5/10 Nokia Lumia 900

Nokia's big WP7 handset is a big disappointment.

SMARTPHONE

www.nokia.com.au @

\$699 \$

Impressive front-facing camera. Poor screen, WP7 already superseded. ✓ x

Nokia just can't catch a break. The Lumia 800 was widely lauded – and rightly so – but its follow-up, the larger Lumia 900, has been hampered by forces almost entirely outside its control. On the surface, all seems well: matching up the ease of Windows Phone 7 with a 4.3in display should make for a good phone, although it's disappointing that we don't get the 4G version of the Lumia 900 in Australia.

This is otherwise easily a better phone than the HTC Titan 4G, but it's hampered by Microsoft in several ways. For a start, the boost in screen size isn't matched by a boost in screen resolution, so with a maximum of 480 x 800 resolution, things can be a little blocky. Like the Titan 4G, you're also stuck with 16GB of onboard storage with no expandability. The Lumia 900 borrows the sleek style of the Lumia 800, but in this larger case it doesn't look as good or feel as comfortable in the hand.

There's a bigger problem for the power user, however, because Microsoft has already announced Windows Phone 8 with a bevy of tasty upgrades – and the Lumia 900 will get none of those. If you're a big fan of the platform you'd be wise to wait. At \$699 outright, the Lumia 900 is arguably a little pricey – you could get a much more powerful handset on other platforms – and for those who adore WP7's elegance, it's a bit of a dead end that's arguably best avoided.

Alex Kidman



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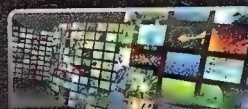


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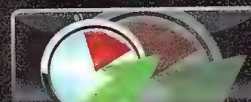
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8/10 Gigabyte Aivia Osmium

Just the thing for typing out your WOW blog.

KEYBOARD

www.gigabyte.com.au @

\$150 \$

Mechanically excellent. ✓

Expensive and bulky. ✗



It's hard to avoid the waft of adolescence emanating from gaming peripherals like Gigabyte's Osmium keyboard. Between the gaudy LED-backlit aesthetics and laughable marketing ('hard, rare and noble'), there's a desperate need to be liked and respected here that reminds us uncomfortably of our high school selves.

If you can get past those virginal connotations, the Osmium is a surprisingly solid peripheral. Admittedly, between the high-quality Cherry MX switches, USB 3.0 and audio/mic passthrough, there's a solid mechanical basis here that's hard to screw up, and Gigabyte has done well to capitalise on those ingredients and make a genuinely good product.

To start with, key actions are very quick (Gigabyte claims a relatively small 4mm of travel), making for a very fast gaming – or typing – input registration. The feel of the board on the whole is also pleasant. For a mechanical keyboard, the Osmium is relatively quiet. It's still clacky, don't get us wrong, but not distractingly so, and the detachable wrist guard and multiple angle adjustment options make it easy to get this board in just the right desk position. As you'd expect from a

'pro gamer' board, macros, game-specific keys and (sigh) adjustable LED backlights are all here, too.

Looks aside, the only complaint we really have is that at \$150, this is a pretty substantial outlay for a peripheral that's not exactly worlds apart from a typical name-brand keyboard. However, if you've got the cash and are determined to get the finest gaming keyboard money can buy, this is probably it.

Dominik Krupinski



8/10 Gigabyte Aivia Krypton

A new mouse that caters to all your foot needs.

MOUSE

www.gigabyte.com.au @

\$115 \$

Excellent comfort, highly precise. ✓

Pointless additional feet, high price. ✗



A well-designed input peripheral can be a thing of beauty – the refined ergonomics of classier mice and keyboards self-evidently require endless thought and iteration. But the 'extreme gaming' market cares not for subtlety: when every vendor sells products built around super-sensitive lasers and dozens of buttons, the challenge isn't refinement, it's rad differentiation. In the case of this Gigabyte gaming mouse, that stand apart feature is feet.

Spec-wise, the Aivia Krypton is pretty typical of higher-end wired mice. You've got your super-fine laser sensor (with a claimed maximum of 8,200dpi), programmable macros, adjustable weights and buttons all over the shop: 11 in total, including a handy macro swap thumb switch. But the Krypton also comes with a pair of swappable bases – one Teflon coated, the other ceramic. The claim is that this offers users a choice between speed and precision, and

having tried them out, we guess that's true.

The ceramic feet do make for a more skittish mouse, while Teflon offers a smoother experience for better control. That said, we just don't see the appeal in a mouse that already offers finer-grained sensitivity adjustments at a sensor level.

Surprisingly, given our distaste for its gimmicky *raison d'être*, it's the most basic of factors that saves the Aivia Krypton mouse from irrelevance. Simply put, this is an extraordinarily comfortable mouse. The mildly ridged top and soft, textured sides are a pleasure to hold, and combine with the sensitive laser to make for a very precise pointing experience.

That doesn't entirely make up for the inflated price an extra pair of (soon to be discarded) feet begets, but if you're willing to look past that issue – or love the idea – there's a great upmarket mouse here.

Dominik Krupinski



9
10

Hitachi Touro Desk Pro 4TB

Need more space? The Touro Desk Pro has it in spades.



EXTERNAL USB HARD DRIVE

www.hgst.com @

\$350 \$

Very fast, tons of capacity (obviously), stackable. ✓

Supplied software and online service are hardly awe-inspiring. ✗



Despite long years of talking about superparamagnetic limits and maximum bit densities, hard drive manufacturers manage to keep upping the ante. The latest to upsize its external drive is Hitachi, which has recently released the Touro Desk Pro 4TB, an external USB 3.0 desktop (mains-powered) drive that managed to be both the fastest and largest external hard drive we've tested.

We ran the same battery of tests on the Touro that we ran on the 3TB drives in our July issue, and the Hitachi topped the field in two out of four tests: small file reads at 33.5MB/s and large file writes at 81.6MB/s. There's clearly no performance sacrifice here, despite the gargantuan capacity.

The Hitachi has one other appealing aspect: it's designed to be stackable. It's unnecessarily thick, but we love the simple design decision to make it flat, so that multiple Touroos can be stacked on top of each other. This is perfect for people who need a lot of data storage space or who are connecting multiple drives to devices like lounge room media players and TV sets. You'd think that would be a common feature of desktop drives, but it's not (though WD drives are often designed for side-by-side stacking).

The Touro comes with some rather weak backup software

– seriously, stick with Windows Backup – and a free 3GB Hitachi Backup online storage account is advertised prominently on the box. The latter isn't exactly a huge selling point, since it seems you can get that at www.hitachibackup.com anyway without having to buy a hard drive.

Ultimately, if it's extras that you want, the Touro is probably not for you. But if you want a fast drive with tons of capacity at a reasonable price, the Touro is a good bet.

Nathan Taylor

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8/10 Apple AirPort Express

An improvement, but not a must-have.

WI-FI ROUTER

www.apple.com/au

\$119

Brings the AirPort Express mostly up to spec with other Wi-Fi routers.

Still no Gigabit Ethernet or USB storage sharing.

How do you transform an already great Wi-Fi travel router into the perfect travelling companion? Apple either has no idea or no inclination because it's settled for making the new AirPort Express only better by degrees.

That's not to say this compact device is without merits. A second Ethernet port now lets you connect the AirPort Express directly to a laptop – the previous model was a Wi-Fi-only affair. But we'd smile more if this jack supported a high-speed 1Gbps connection instead of redlining at a dusty 100Mbps.

This new model at least lets you create two separate password-protected wireless networks, thanks to dual-band 802.11n Wi-Fi. Park your laptops and tablets on one of the faster 5GHz channels while leaving the more crowded 2.4GHz channels for smartphones and the like. Performance is up to snuff for short- to medium-range scenarios: a hotel room, office suite or single-storey apartment. On 5GHz we clocked just shy of 12MB/s sitting 5m away, with speed halved to 6MB/s at 30m. On 2.4GHz the same tests yielded around 6MB/s and 3MB/s.

Apple's simple setup software dumps the web interface (running from an AirPort Utility app for Mac, iOS or Windows) and lets you easily add guest access to either network. However, as before, the USB port remains locked to just



adding a shared printer: you still can't hook up a hard drive, which would be a boon both at home and on the road.

As always, when you're not on the road the AirPort Express can be hooked up to a home theatre to provide internet access for your TV or to beam music from your Mac's iTunes library through your stereo.

While the improvements in the new AirPort Express are worthwhile, we wish Apple had gone the extra mile to make this a must-have bit of kit.

David Flynn



3/10 Sony NSZ-GS7 Internet Player with Google TV

Google still can't search out a good TV experience.

MEDIA PLAYER

www.sony.com.au

\$349

Adds Picture-in-Picture, app support.

Pricey, lack of apps, poor onscreen UI, mostly pointless with exclusive TV bundling.

The NSZ-GS7 is an HDMI passthrough-capable Google TV box, which brings Android-style applications over the Google TV platform to any HDMI-compliant television set. The passthrough is important, because it allows Google TV to overlay existing TV channels; it doesn't know what's being played, but allows for Picture-in-Picture web surfing and app access. The remote control is an innovative piece of kit with a touchpad and buttons on one side and a full QWERTY keyboard on the other.

Which all sounds good in theory, until you actually try to use it. Inputs are slow and imprecise, and while the embedded Chrome browser can handle a lot more than most TV-based browsers, it's sluggish and hard to control with the trackpad. Picture-in-Picture is actually an overlay rather than a split screen, so if you're watching telly while doing something else, the TV part of the screen is obscuring the action hugely.

Up until August 12, the Player was also only available as a 'free' offering with certain high-end Sony TVs, which is equally baffling, as many of the best features are ones that are also built into Sony's smart TV platform.

There's clearly a market emerging for the kind of 'second screen' action that Google TV aspires to, but if the overpriced



(Sony reckons it's worth \$349, although you can't actually buy it outright) NSZ-GS7 is an example, it's not something that Google's cracked yet.

Alex Kidman

6 10 Konica Minolta Magicolor 4750DN

A sideways look at colour printing.

PRINTER

www.konicaminolta.com.au @

\$1,299 \$

Good-quality print, achieves claimed run-on speed. ✓

Substantial delay on first page and when printing photos. ✗

The 'sideways on' design of the 4750DN means you'll probably need to position it on the right side of a desk or table for ease of access to the secondary paper feed, otherwise it won't provide any real saving in terms of space. Providing front access to the paper cassette and toner is sensible, though we prefer everything is accessible from the front or top.

There's the customary status monitor plus PageScope Direct Print for printing PDF, TIFF and other file types without opening another app. A useful feature of that utility is the ability to set up 'hot folders', which automatically print files that are dropped into them, with parameters such as double-sided printing set on a per-folder basis. Administrators can control the use of the printer.

PCL6 and PS drivers are installed by default and there's also an optional XPS driver. As usual, we selected the PCL driver for testing. The timings were less consistent than usual, but a relatively slow 58 seconds for the first page and then 2 seconds for the second page (consistent with the nominal 30ppm) was representative, along with 72 seconds for duplex output. Text and business graphics were of good quality,



though we'd prefer that the toner was less glossy.

A plain black page printed very evenly, with a slight leathergrain effect and no visible banding. As for digital photos, above average results were obtained at the cost of speed - 3:20min for an A4 print, with the 'processing' message appearing on the front panel for most of that time. Konica Minolta suggested the installation of additional RAM (256MB is standard) would improve the processing speed.

There's provision for printing from USB storage devices, but our review sample lacked the required hard disk or CompactFlash options.

Stephen Withers

6 10 Brother HL- 3075CW

Nice text, shame about the colour.

PRINTER

www.brother.com.au @

\$270 \$

Good access controls. ✓

No duplexer, sub-par colour matching. ✗

The HL-3075CW is a colour LED (laser-like) printer for small offices. USB, Ethernet and Wi-Fi (but only b/g) are standard, and it has built-in access controls to prevent selected users from printing in colour, impose page count limits and so on.

The software bundle is minimal: apart from the driver and status monitor, there are a selection of three remote admin tools (it also has a web interface, but its use of fonts and colours has a 1990s aesthetic) and a driver deployment wizard that could simplify the setup of multiple PCs.

The yellow toner was badly misregistered out of the box, but going through the manual registration process brought the four colours into alignment. Brother recommends alignment every time a toner cartridge is installed.

The main tray takes a full ream of paper and the manual feed flips down above it. That flap is quite short, which means it's unlikely to suffer accidental damage if left open.

Our business document test showed it could deliver on its 18ppm rating, with the first page dropping in 22 seconds and page two following 3 seconds later. Text quality was excellent, but while we were generally happy with the appearance of the graphics elements, a couple of usually bright green areas were better described as acid green.

Photos were printed on the dark side (sky blues took on a



purplish shade, for example, while skin tones seemed somewhat grey), but the low-gloss toner gave otherwise pleasant results on plain paper. The exception was our all-black page, which revealed uneven coverage, with horizontal and vertical banding.

Unusually for printers in this segment, the HL-3075CW prints .PDF or .JPEG files from USB storage plugged into the front socket, which can also be used for PictBridge printing from cameras. Brother's iPrint&Scan mobile app also works with this model.

Stephen Withers

10/10 Adobe Creative Cloud

Adobe sticks its head in the cloud.

SOFTWARE

www.adobe.com/au @

From \$37.99 a month \$

All Adobe Creative Suite 6 apps, 20GB cloud-based storage. ✓

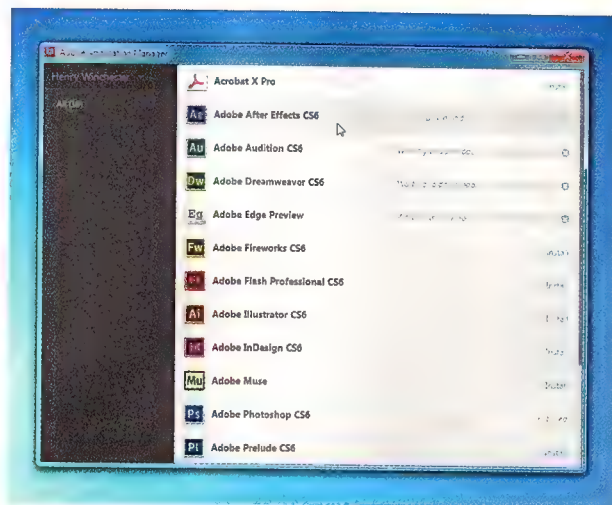
Costs a small fortune annually. ✗

Adobe rules the roost of creative software. Even this magazine is put together with a host of the company's software and with good reason. It works incredibly well and it's the most cutting-edge software you can get. It's something of a surprise then that Adobe has only just ventured forth into cloud computing.

Creative Cloud is accessed through Adobe Application Manager, a client app that enables you to download Adobe's whole suite, albeit with subscription-based payments. There's a 30-day free trial of the system and from there on you can pay on an annual or monthly basis. At the time of writing, an annual contract costs \$62.99 a month, whereas a month-to-month subscription is \$94.99 a month. An introductory offer for existing customers costs \$37.99 a month.

What do you get for your money? Just about everything Adobe has. As well as stalwarts like Photoshop, InDesign and After Effects, you're given access to Illustrator, Premiere Pro and Acrobat X. These are the full, unlimited versions of each piece of software, and you can pick and choose which ones you download with the manager. In addition to the software, Adobe includes 20GB of online file storage, site hosting and PDF creation.

While it does inevitably end up costing a small fortune over the course of a year, the ability to rent software from Adobe on a monthly basis rather than buying it outright is attractive to creative businesses, who may need to hire a freelance



designer to work on a short-term project. It also appeals to those wanting to try out Adobe's software for longer than the 30-day period.

Photoshop is one of the most pirated pieces of software in the world, currently standing third in Windows apps on torrent site The Pirate Bay. Although its pricing may be too high for some, Creative Cloud is a great option for those who want Adobe's software while keeping their fingers clean.

Henry Winchester



8/10 Camtasia Studio 8

Record your PC's video output with narration.

SOFTWARE

www.techsmith.com @

US\$299 \$

Full-screen recording, multitrack timeline, social media sharing. ✓

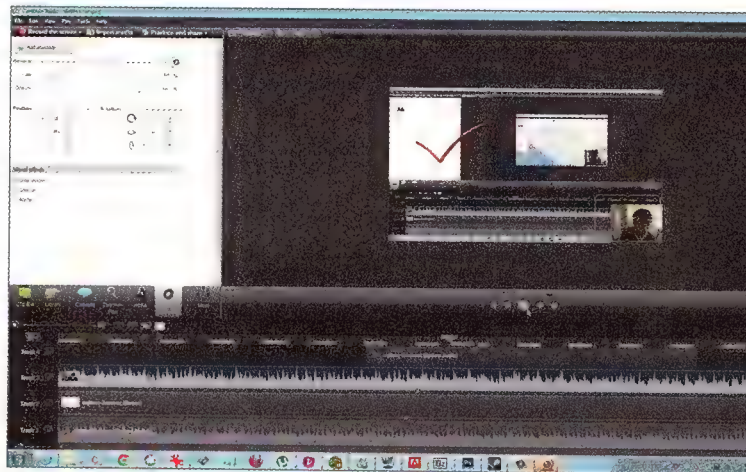
Cost is a factor, considering there are similar free options available. ✗

Screencasting is a sub-genre of web broadcasting and consists of a video of whatever's displayed on a Mac or PC screen, with narration provided by a 'screencaster'. It may not sound like the most engrossing format, but it has its uses. Computing tutorials on YouTube are popular and screencasting is used in the sub-sub-genres of speed painting and computer game narration.

Camtasia is an all-in-one product designed specifically for creating screencasts. It will record either your entire desktop or a small portion of it, and it accepts video and voice inputs from your webcam or microphone simultaneously. It then plays back your footage and launches a multitrack editing suite for you to retime, crop and trim your project.

As well as these standard video editing tools, Camtasia includes specific options for screencasting. The cursor can be highlighted with the rest of the screen greyed out, and you can pan and zoom on key portions of the video. Arrows are used to point out specific parts, while text captions add extended information to your video. There's even a text-to-speech system for subtitles.

We experienced no system slowdown when we tested Camtasia on a Windows desktop, and the video and audio feeds were smooth, with no lag. The real test for screen capture software is gaming, though. The game pushes any PC to its limits, and the extra audio and video processing from



the capture software could potentially cause crashes and lag. Camtasia proved itself up to the job, though, slickly recording a battle in *Modern Warfare 3* while also capturing audio from our microphone.

At US\$299 it's pricey and you could achieve similar results with free software like CamStudio, Windows Live Movie Maker and Audacity, but this fragmented approach is less intuitive. It's a polished product and recommended for anyone with an interest in screencasting.

Henry Winchester





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7/10 AMD Radeon HD 7970 GHz Edition

AMD's surprise attack.

COMPONENT

www.amd.com @

\$590 \$

Excellent performance at this price point. EyeFinity support. ✓

Very loud cooler, not the best DirectX 11 performance. ✗

Released in March this year, AMD's Radeon HD 7970 barely had enough time perched atop the performance throne for the cushion to get warm before Nvidia's GTX 680 waltzed in and stole it back. AMD soon returned fire with heavy price cuts, while simultaneously ensuring there were plenty of cards in the channel, a problem that Nvidia's hard-to-find GTX 680 still suffers from. However, it didn't take long for the new GeForce GTX 670 to undercut the 7970's price, performance and availability, and that's where we thought the story would end until the next generation of products hit.

Instead, AMD has surprised us all with the sneaky launch of the new Radeon HD 7970 GHz Edition. Normally we know months in advance of a new product, but this graphics card was heralded by a short email the day before our review sample landed. We're not sure whether that's clever marketing or a desperate last-minute launch. Regardless, it appears AMD has finally caught on to a fact overclockers have known since the launch of the original HD 7970 – this GPU overclocks rather well. The GHz Edition uses an identical graphics chip to the HD 7970 in the form of the Tahiti GPU, and it's mounted on an identical PCB to its predecessor. Even the cooler is totally unchanged.

Where things get interesting is the new card's default GPU speed, which has been bumped up from 925MHz to – you guessed it – 1GHz. This alone should give a tidy 8% performance increase in GPU-limited applications. The memory has also been improved, now using 1,500MHz GDDR 5 memory, another small 9% increase from the vanilla card's 1,375MHz memory speed.

The final tweak is the introduction of PowerTune with Boost, a slight change to the throttling technology AMD has used for years. It's borrowed a leaf out of Nvidia's book, with the GPU frequency automatically increasing if it detects there's some thermal headroom left while running a game. However, AMD's approach is far more conservative than Nvidia's, increasing to just 1,050MHz.

To test AMD's claims that the Radeon HD 7970 GHz Edition is the fastest single-GPU video card on the planet, we put it up against the ASUS GTX 680 DirectCU II, a factory-overclocked version of Nvidia's fastest single-GPU product. After all, AMD's card is basically a factory-overclocked version of its fastest product, right?

As expected, AMD's product still couldn't match Nvidia's DirectX 11 performance in the 3DMark 11 benchmark, trailing by 23%. The Nvidia card then took a smaller 4% lead in *DiRT 3*, but AMD returned fire with a strong *Batman: Arkham City* result of 9% ahead. That's just one win out of three, though, so the new card doesn't quite live up to AMD's hyperbole.

Where this card does compete against the GTX 680 is in pricing and availability. Simply put, it's often cheaper and more widely available. Unfortunately the GTX 670, which we feel is this card's closest competitor, has recently dropped down to \$450. Tweakers and AMD fans may still find the default HD 7970 the better option, as they can untap similar performance for around \$470, but if you don't feel like tweaking, the GHz Edition offers excellent performance at around \$600.

Bennett Ring



8
10

Gigabyte GV-N6700C-2GD

Gigabyte delivers a potent mainstream performer.

COMPONENT

www.gigabyte.com.au @

\$500 \$

Excellent performance, strong factory overclock, quiet cooler. ✓

Needs voltage tweak for stability, cooler developed a rattle. ✗

What do you get when you combine Nvidia's GeForce GTX 670 GPU with a full-length PCB and a custom tri-fan cooler? This factory-overclocked killer from Gigabyte, of course. Gigabyte has gone to town on the feature set of this potent product. The designers have increased the power inputs over a standard GTX 670 card, using one six-pin and one eight-pin plug, but more importantly, they've cranked up the GPU frequency, with a new boost maximum of 1,200MHz, up from the default boost of 980MHz – a huge increase.

As a result, this is a blisteringly fast card, delivering about 95% of the performance of a stock GTX 680 at a price that's 30% cheaper. The added speed doesn't come entirely without cost, however. It seems Gigabyte hasn't increased the default

voltage enough to handle the high speeds, so we suffered regular crashing for the first few hours. After bumping the voltage to 1.05V, the card became 100% stable. The custom cooler kept the card cool despite the voltage increase, while remaining silent most of the time. However, after purchasing two of these cards (we were that impressed with them), one fan developed a noticeable rattle at certain speeds.

Despite a few niggles with Gigabyte's implementation of the GTX 670, there's a lot to love about this card. Delivering most of the performance of its big brother at a much cheaper price, perhaps the best thing about these cards is that they're readily available.

Bennett Ring

6
10

MSI R7770-2PMD1GD5/OC

An overclocking card that's not quite worth the effort.

COMPONENT

au.msi.com @

\$180 \$

Customisable cooling solution. ✓

Too expensive, arguably not worth overclocking. ✗

We've got to give MSI's R7770 Power Edition graphics cards points for novelty. We honestly can't say we've seen the likes of this fan setup before. This lower mid-range card comes out of the box with a decent factory overclock (an extra 10% – 100MHz – on the core), a single 92mm fan and the sort of relatively short shroud we've come to expect from AMD's budget Radeon HD 7770 GPU.

Dig around in the packaging and there's a second fan to be found, which you can attach either above the card's existing blower for 'more pressure' (we're kind of dubious) or in series by extending the shroud backwards, as you can see in our photo. It's a novel setup that lends it a bit of DIY appeal. And with PC games' graphics requirements remaining fairly static, it's arguable that component upgrades are as much about tinkering as frame rates nowadays, so we can rate that.

However, the Radeon HD 7770 core at the heart of this card probably isn't the GPU for much home customisation. This is a relatively low-power card that can get by just fine on one fan and although additional cooling (as well as a variety of voltage adjustment options) can no doubt yield some extra performance, we think potential buyers will be better served by other options. Either spend the additional cash MSI is asking for over a stock HD 7770 (around \$50) to buy a more powerful model – this one isn't quite up to high-detail 1080p gaming, managing 28.6fps in *Crysis 2* – or save cash with a vanilla budget card and get your kicks elsewhere.

Dominik Krupinski





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2 **Bamboo Stylus Duo** ▶

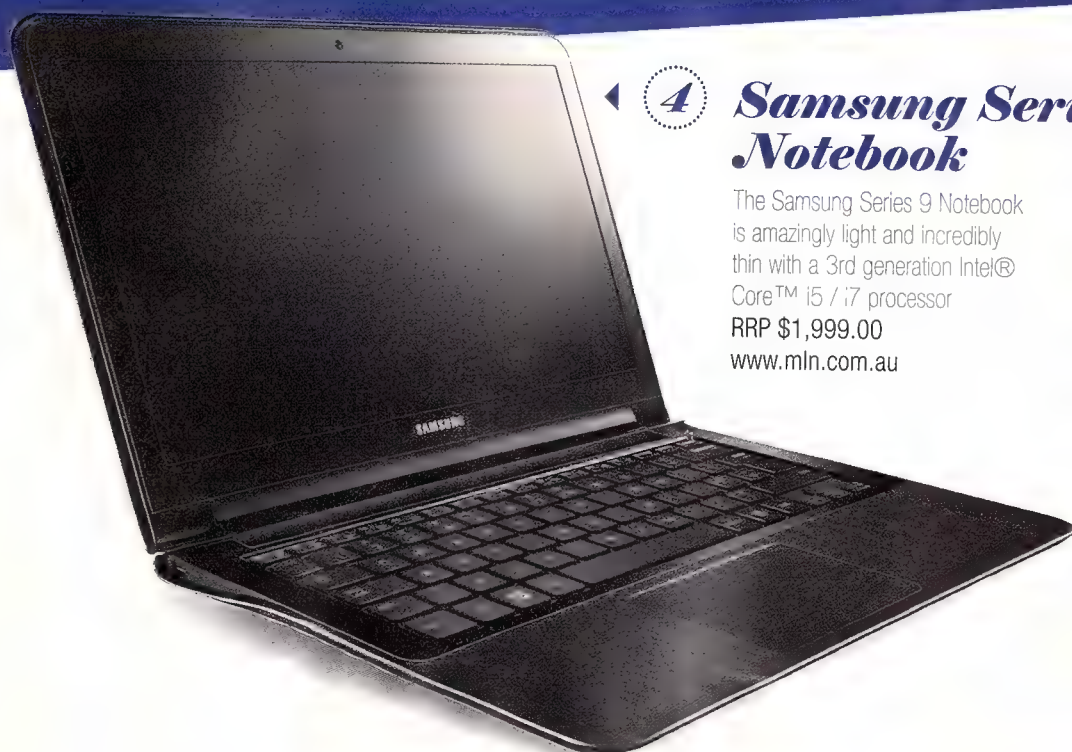
Bamboo Stylus duo is the ideal tool for writing, drawing or doodling in both a digital and analogue world

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THE ULTRA-CHEAP COMPUTER REVOLUTION

Darren Yates looks at how sub-\$100 single-board computers and tablets are changing the face of computing.

To younger generations, today's computing world began with the rise of the internet in the mid-'90s. In reality, home computing dates back to the late 1970s and early '80s. Built on the back of classic machines like the Commodore 64 and VIC-20, the Tandy TRS80 and the Sinclair ZX81, these small steps into the world of computing became surprisingly affordable. As newer, more sophisticated computers appeared on the market, older models were discounted, sowing in buyers the first seeds of doubts about 'future proofing'. No-one really cared because these discounted models were cheap. Dirt cheap. I personally remember seeing Commodore Plus/4 and Texas Instruments TI99/4A computers being sold by electronics stores in Australia during that time for just \$99. But it wasn't long before the bean counters at Microsoft, IBM and Intel spoilt our fun, took the whole thing far too seriously and wanted to do serious work, of all the nerve! In a twinkling, hobby computers all but disappeared as 'IBM-compatible' became the buzzwords.

Over the last few years, there's been a slow burn return to those frontier days. And it's largely thanks to the internet and sites like Make,

MakeUseOf and countless others. That slow build has turned into a stampede over the last six months, as low-cost ARM processors and Linux have grown into an irresistible combination. In fact, the next six months look set to be a full-on revolution.

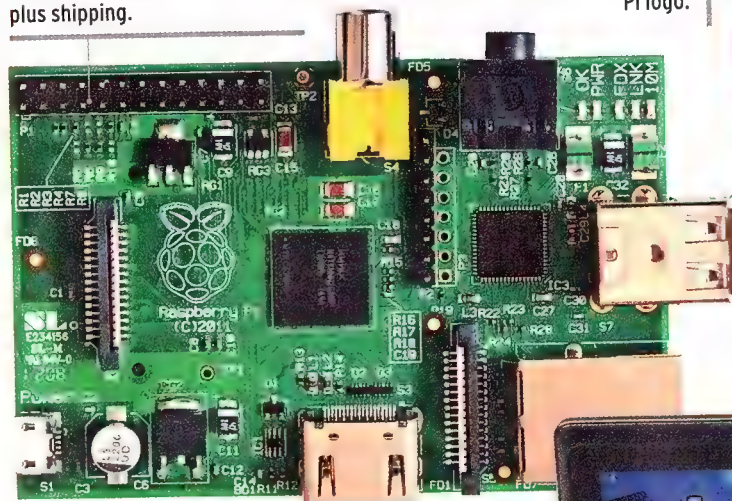
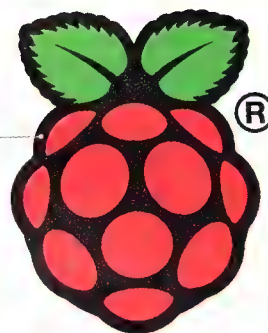
SINGLE-BOARD COMPUTERS

The return of low-cost computing scored its first goal in 2006 when the OLPC (One Laptop Per Child) project gained the support of the United Nations to build a low-cost laptop for kids in the developing world that could be built for under \$100. Although it's never quite hit that magic price point, further development of the ARM processor architecture and Linux has seen prices continue to fall.

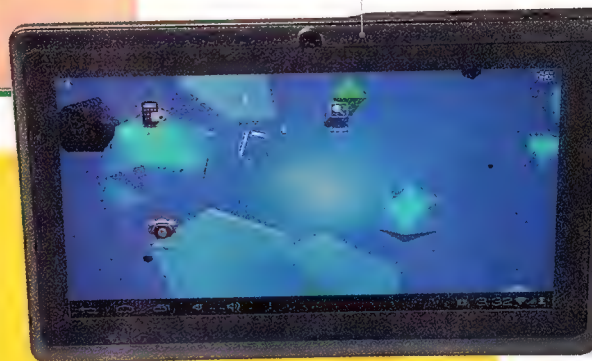
Then word began to filter out late in 2011 that a UK group was about to stun the world with a tiny computer, featuring an HDMI output, USB and Linux. The price? An astonishing \$38. A few people questioned whether a computer at that price could be of any use, but the developers needn't have worried – since its release in March this year, worldwide demand for the Raspberry Pi has been so great that it's almost permanently on

The Raspberry Pi, available from www.element14.com for \$38 plus shipping.

The official Raspberry Pi logo.



\$75 7in Android tablet with Android 4.0.3, bought on eBay.



back order. Today, they're making 4,000 a day just to keep up.

To be fair, the Raspberry Pi wasn't the first single-board computer (SBC) on the market. Low-cost microcontrollers from Atmel and PIC have been around since the mid-1990s, but they've generally been single-task systems, used to create everything from car performance kits to stereo FM transmitters. The Pi was the first to show that ARM processors were now so cheap – yet powerful enough – to turn into low-cost full-function computers.

Since the release of the Pi, hardware developers have been launching themselves onto the bandwagon and there are now over 40 SBCs on the market. Most importantly, a dozen or so of them are crashing through the \$100 barrier.

UNDER THE BONNET

What makes these SBCs possible is the growing sophistication of 'system on a chip' (SoC) processors. These low-cost CPUs, based on the ever-popular ARM architecture, contain everything from memory controllers, USB ports and GPU all on the one piece of silicon. And they're now becoming deliciously cheap. While popular chips from the likes of Nvidia, Samsung and Qualcomm drive almost every smartphone and tablet in existence, lesser-known, low-cost, high-performance parts are arriving from China.

Look at any budget tablet selling for under \$150 on eBay at the moment and it's almost guaranteed to be running an Allwinner A10 ARM chip. Rumours are this Chinese-developed CPU costs just \$7 in quantity yet its single core clocks at up to 1.5GHz (much higher than the competition), features accelerated H.264 video and a 400MHz GPU for accelerated graphics. Throw in HDMI, Ethernet and USB, and you've got a powerhouse chip for the cost of a couple of coffees.

The Raspberry Pi itself features Broadcom's 700MHz BCM2835 media applications processor. Not much is known about its price, but it's rumoured to be costing the R-Pi Foundation around \$11. For your money, the chip delivers full 1080p H.264 acceleration and HDMI output. It's even designed to handle digital camera image sensors up to 20MP and a new 5MP camera module for the Pi has just been announced to sell for around \$25.

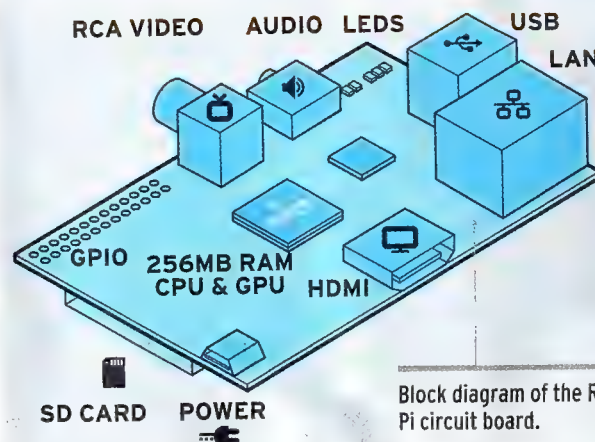
SBCs like the Raspberry Pi are usually powered by USB, but require significantly more power if you start throwing in keyboards, mice and portable hard drives. Ideally, they need a 5V/2A power supply to keep them ticking over. You can pick these up from eBay for under \$5 and most electronics retailers for under \$20.

The block diagram of the Pi (right) shows just what the developers have managed to squeeze into this tiny system. The circuit board is multilayered like standard motherboards and in the case of the Pi, also comes with what's called a General Purpose Input/Output (GPIO) bus to allow you to interact with the outside world, such as turning lights on and off, operating solenoids and other external electronics.

THE \$75 ANDROID TABLET - IS IT ANY GOOD?

It's not just SBCs having all the fun under \$100 – there are a number of Android tablets now available under this price, thanks mostly to the Allwinner A10 CPU. Sub-\$100 Android tablets have been available for a while, although last year's models featured sub-800MHz CPUs, resistive touchscreens and ran Android 1.6 or Froyo (2.2) if you were lucky. Now, tablets with 1.5GHz processors (admittedly still single-core) are common, as are capacitive touchscreens and Android 4.0 operating systems. You'll even find a smattering with onboard HDMI outputs.

We picked up a 7in Allwinner A10 Android 4.0 tablet from one of the many eBay retailers for \$75 including shipping. It came pre-rooted, but required a factory reset to fix an occasional yet annoying Android Acore module glitch. Still, it performs pretty well. The 800 x 480-pixel capacitive touchscreen is passable, it lacks HDMI output, but it has a USB OTG port, which means it can handle external storage. I've already had it operating as a wireless file server, passive streaming a 1080p H.264 video over its 802.11n wireless connection to my desktop PC.



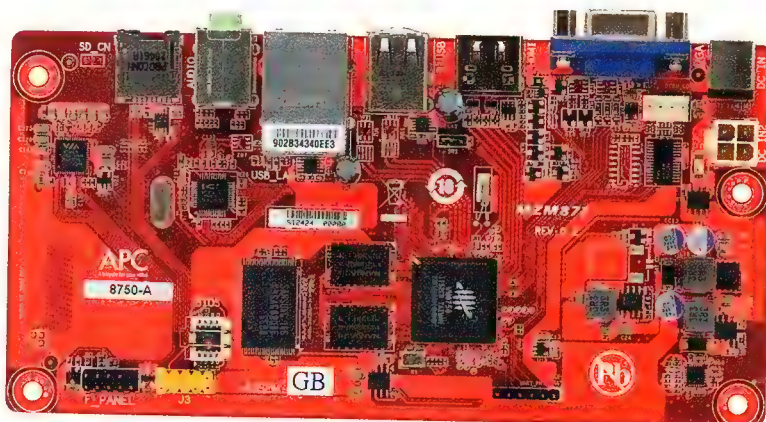
Block diagram of the Raspberry Pi circuit board.

WHAT'S AVAILABLE?

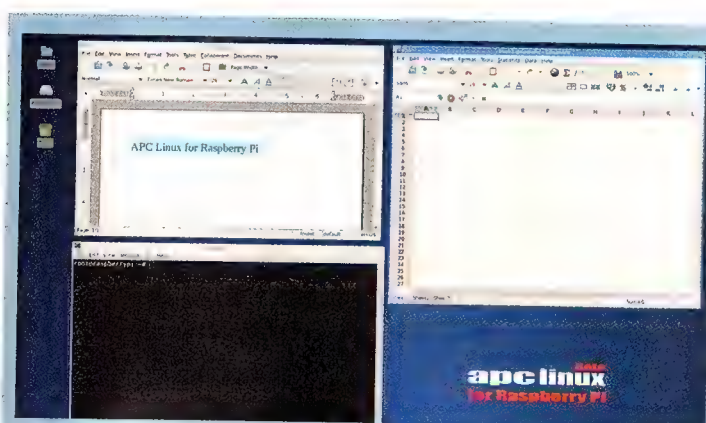
As we said, the Raspberry Pi is really just the battering ram for this ultra-cheap computing juggernaut. We managed to pick up three, including the Raspberry Pi, for this feature, but there's a flood of other models either just about to hit the market or in various stages of design.

The most notable models are the Rikomagic MK802, a tiny Allwinner A10-powered computer little larger than a USB flash drive selling for around \$75 on eBay; and the VIA APC, a soon-to-be-released SBC expected to sell for \$49.

However, the real action is in what are called Android TV boxes. They masquerade as digital media players and there are plenty of them selling online for under US\$100, yet they have everything needed to turn them into low-cost computers. In fact, there's a growing community dedicated to hacking Allwinner A10-based TV boxes and running custom-built Linux



The VIA Technologies rival APC, due for release shortly at US\$49.



APC PILINUX FOR RASPBERRY PI

We're pretty taken by these tiny, cheap SBCs – so much so, that we've built our very own Linux distro exclusively for the Raspberry Pi. APC piLinux gives you a working Debian Squeeze-based Linux distro, with word processing, spreadsheet and even 1080p HD video playback out of the box. And it's yours, free. Check out our rundown on the Raspberry Pi for more details.

EMULATING THE PAST

Want to relive the glory days? There are plenty of freeware emulators to bring back your favourite slice of history. Here are just a few.

TANDY TRS-80

CoCo Emulator (tinyurl.com/cl5m4zc). Tandy's Colour Computer range emulated in DOS.

Virtual MC-10 (tinyurl.com/bosw5tw). My first computer still lives!

COMMODORE

Mobile C64 (tinyurl.com/ceftk9u). Commodore 64 emulator for Android. Artifex (tinyurl.com/cwkyldu). Commodore Plus/4 emulator for Windows. CCS64 (tinyurl.com/lco2up). Bring back your old Commodore 64 memories on Windows.

VICE (tinyurl.com/25yyvq). Emulate Commodore computers on Windows. CBM .prg Studio (tinyurl.com/8xy8d2). Commodore app writer for Windows.

SINCLAIR

The list (tinyurl.com/grq9s). Dozens of ZX Spectrum emulators for both DOS and Windows.

distros on them. And don't kid yourself that they can't do it either – with up to 1.5GHz clock speed, the Allwinner A10 is gaining a reputation as a surprise packet that outclasses the Raspberry Pi.

The latest model we saw as we went to press was the new TV Cloud Stick, which offers a 1GHz Telechips TCC8925 ARMv7 processor, Android 4.0 operating system, HDMI output and twin USB ports, all in a USB stick format for just \$60 on eBay.

You can check it and other sub-\$100 SBCs available at time of writing in the table below.

WHAT'S COMING?

No doubt some will dismiss SBCs as just toys, but we're getting way past that level. Korean maker HardKernel (www.hardkernel.com) is set to release the ODROID-X, an open-source Android development platform, for US\$129. For that price, you get a Raspberry Pi-like SBC with – wait for it – a 1.4GHz quad-core Samsung Exynos 4412 ARM processor, six USB 2.0 ports, microHDMI output and Android 4.0.4 operating system. Plug in a keyboard, mouse and HDMI monitor, load up the operating system via SD card and you're away. You can even install Google Play or Ubuntu 12.04 Linux. It might be a bit over the \$100 mark, but the level of hardware here is just extraordinary – you're talking about the very same CPU that's inside Samsung's Galaxy S III smartphone. We're definitely a long way from Commodore 64 performance here.

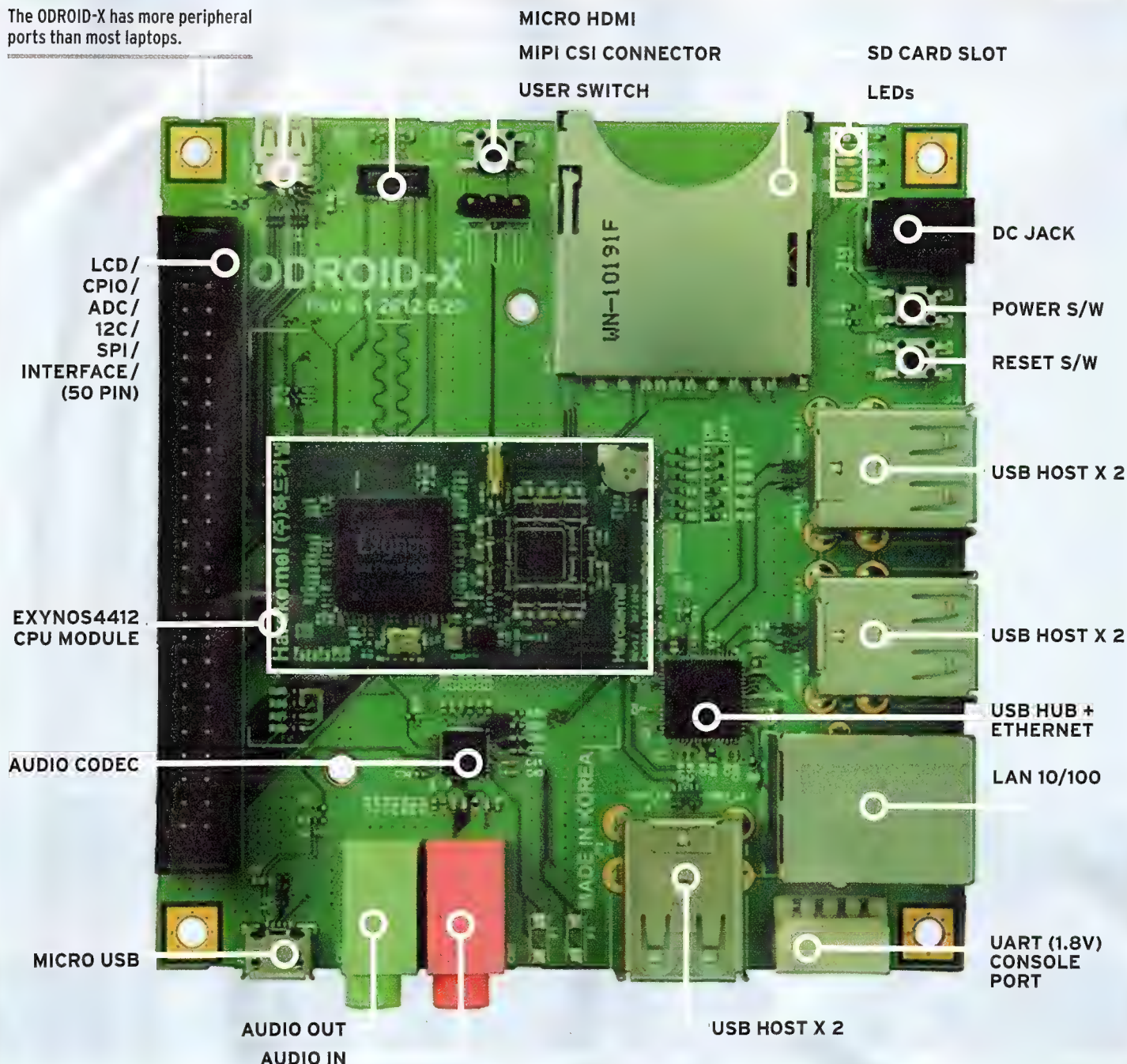
During the writing of this feature, we found new SBCs being launched almost weekly, so while tablets and smartphones are changing the face of consumer computing, the same components are now becoming available for hobbyists in working SBCs at much cheaper prices.

COMPUTERS UNDER \$100: HOW THEY COMPARE

Model	Price	Processor	Available	Where?
CX-01	\$52	1GHz Telechips TCC8923 (ARMv7)	Now	tinyurl.com/c3pep2
Gooseberry board	\$99	1GHz Allwinner A10	Q3 2012	gooseberry.atspace.co.uk
GV-2C	\$65	1GHz InfoTMC iMAPx210	Now	tinyurl.com/7t9nq5u
Mele A1000	\$99	1GHz Allwinner A10	Now	tinyurl.com/8935jyk
Mele A2000	\$99	1GHz Allwinner A10	Now	tinyurl.com/7c72kf2
Oval Elephant K-A10	\$72	1GHz Allwinner A10	July	tinyurl.com/ctq2gnz
Pineriver MiniX	\$85	1GHz Allwinner A10	Now	tinyurl.com/7jkns7p
Raspberry Pi Model B	\$38	700MHz Broadcom BCM2835	Now	element14.com
Rikomagic MK802	\$76	1GHz Allwinner A10	Now	tinyurl.com/86x47nh
Smallart UHOST	\$72	1GHz Allwinner A10	Now	tinyurl.com/cb2qj5v
TV Cloud Stick	\$60	1GHz Telechips TCC8925 (ARMv7)	Now	tinyurl.com/7t4pj2b
VIA APC	\$49	800MHz VIA Wondermedia 8750	July	apc.io

For more, check out Aliexpress.com at tinyurl.com/c96hfy5.

The ODR0ID-X has more peripheral ports than most laptops.

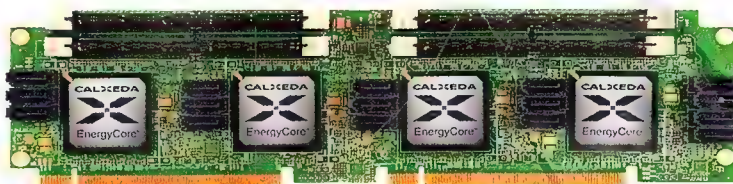


SERIOUS PERFORMANCE

Don't think the big end of town hasn't noticed. SoCs are the new kid on the block in corporate servers, yet they're gaining fans, based on their ability to deliver considerably more performance than traditional server solutions per unit of electrical power. Calxeda has developed ARM server solutions around its EnergyCore ARM SoC that are now sold by HP. Dell is using Marvell's Armada XP 78460 SoC inside its new Copper ARM microservers and to show off how power-miserly SoCs can be, Red Hat recently demoed an ARM-based server powered by a bicycle.

THE FUTURE

However, it's the hobbyist computer reborn out of ARM processors and Linux/Android operating systems that are clearly far more fun. The team behind the Raspberry Pi had the goal to make a low-cost computer that



ARM processors are making it into corporate servers.

kids could afford, have fun with and learn how to program. In reality, they've spawned a new industry. Sure, the Pi and others like it aren't going to replace your PC any time soon (although the ODR0ID-X is getting damn close), but you can be certain they'll only improve over time as dual and quad-core ARM chips drop down in price. Right now, the Raspberry Pi can browse the web, handle Word documents and Excel spreadsheets, and play 1080p H.264 video.

Personally, I'm just waiting for someone to build a Raspberry Pi inside a full-sized keyboard. Now that really would take us back to the Commodore 64...



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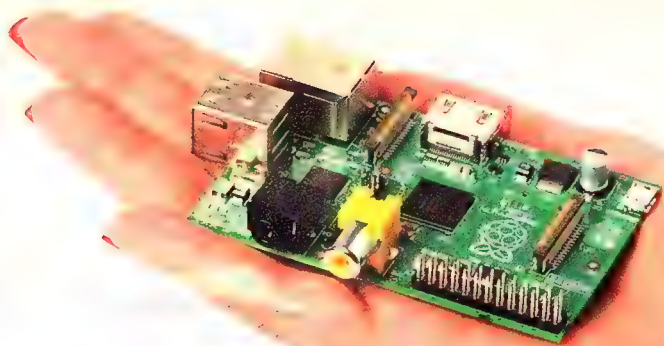
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RASPBERRY PI: THE \$50 REVOLUTION

It's the computer that's turning heads. Darren Yates introduces you to the Raspberry Pi, the single-board computer that's cheaper than taking the kids to the movies.

Imagine a circuit board the size of a compact Android phone, surrounded by sockets with a tiny processor in the middle and you've pretty much got the Raspberry Pi single-board computer (SBC). Designed in the UK and available in Australia through Element14 (www.element14.com), the Raspberry Pi gives you a fully functioning computer for \$38 plus shipping. That means that your overall outlay wouldn't be much more than \$50.

CONNECTIVITY

The board itself features a wide array of connection options including composite video out and HDMI output, along with 3.5mm stereo analogue audio, two USB Type-A/host ports plus a microUSB port for power and built-in 10/100 Ethernet socket.

There's no storage on board, but you can supply up to 64GB through the SecureDigital card slot on the underside of the board, which also supplies the bootup mechanism and the operating system you run.

THE PROCESSOR

The brains behind the Pi is Broadcom's BCM2835 SoC, a 700MHz single-core ARMv6 media applications processor with 256MB of onboard RAM and accelerated H.264 decoding up to 1080p (1,920 x 1,080-pixel) resolution at 30fps. Because it uses the superseded ARMv6 architecture, though, it doesn't run Android, nor will it run any Ubuntu-based Linux distro. However, Ubuntu's parent distribution, Debian, does support ARMv6 and you'll find one or two options available (including our very own APC piLinux for Raspberry Pi).

The drawback at the moment is that although the BCM2835 has a hardware

floating-point (HFP) processing engine, most available distros use software-based floating-point processing, which is considerably slower. But just as we went to press, Raspberry Pi made a decent move forward with the HFP release of a new official Debian Wheezy distro specifically built for the Pi. Reports are that HFP can increase performance by as much as 60% or more.

Importantly, though, you don't need ARMv6/HFP to play back 1080p H.264 video – while you do need to keep the overall video bit rate down to around 3.5Mbps, the Pi will do the job on the standard ARMv6 Debian release.

BOOTING UP THE PI

We'll look more at this in a moment, but the Pi requires a special two-partition boot disk in order to launch: a small 64MB FAT32 boot partition and a secondary extended (Ext4) formatted partition with the operating system proper. Windows doesn't support multi-partition creation on SD cards or flash drives, but Pi-compatible distros come as an .IMG file that's basically a multi-partitioned ISO image, which you can write to an SD card using a free Windows utility.

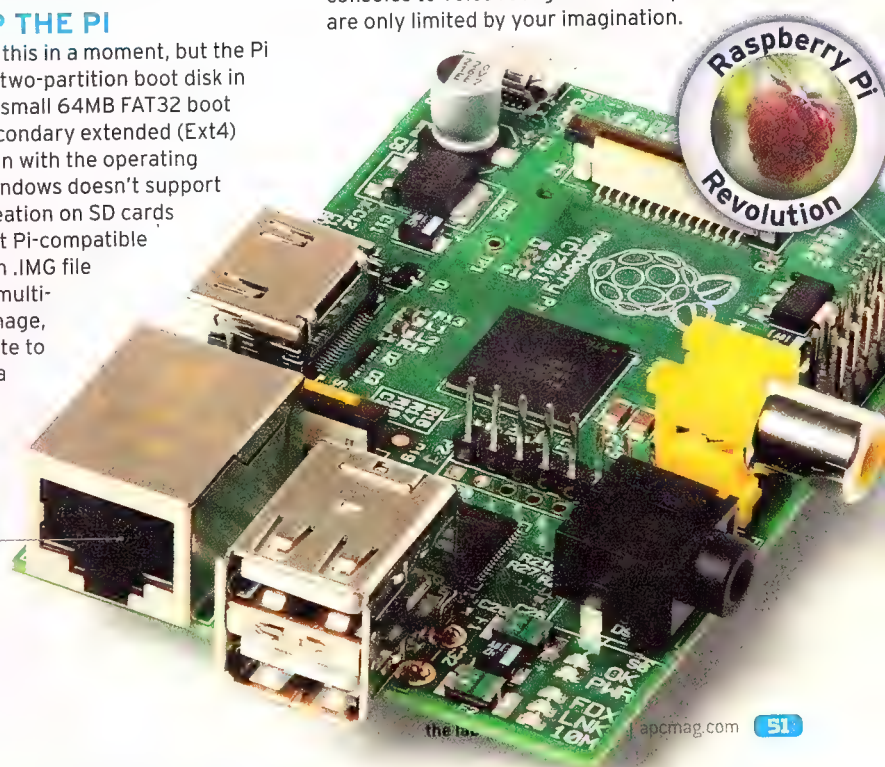
The Raspberry Pi is a fully functioning computer the size of a compact Android phone.

You can use any SD card 2GB or larger, although we'd recommend an 8GB card (they're cheap enough) and one that's at least Class 6 in speed.

Starting the Pi is pretty simple – there's no power button or reset button. You simply add power to the microUSB port to power up and remove it to power off or reset.

IMAGINATION

If you're looking for a complete computer system with nothing to do, it might disappoint you. However, there are some incredible projects being built around the Pi, from gaming consoles to voice recognition – the possibilities are only limited by your imagination.





MAKING THE PI WORK

Darren Yates looks at all the parts needed to make the Raspberry Pi a working computer.

Given the Raspberry Pi gives you nothing more than a circuit board, you'll need to supply a few extras of your own in order to turn it into a fully functional computer. While the Pi supports a composite video output, meaning you could use almost any video display, the simplest option is an HDMI-capable monitor. The Pi's HDMI port is a full-sized one, so any basic HDMI male-to-male cable will do the job.

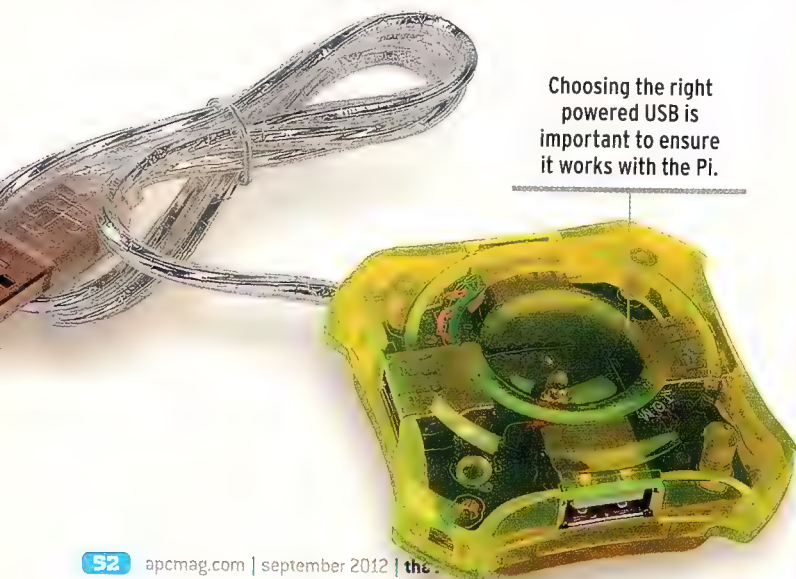
POWER SUPPLY

However, the most critical element is the power supply. On its own, the Pi needs a minimum 5V/700mA DC power feed to get it up and running. However, in practice, you need at least a 5V/1A (1,000mA) supply. We managed to power the Pi using an HTC smartphone 5V/1A adapter. The fact that the Pi also uses a standard microUSB port to supply the power meant we used the HTC data/power cable, too (as we said, the Pi comes as a board only). While this worked for us, we can't guarantee every 5V/1A adapter will work. As you'll read in a moment, not all USB-ready power adapters are worth the power they claim to deliver.

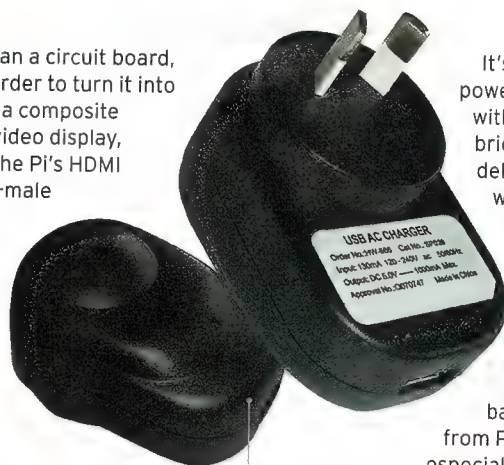
The Pi has two USB 2.0 ports, although they're current limited to 140mA each, whereas the standard USB 2.0 port usually delivers up to 500mA. This gives us two problems: not only are we limited to light-load USB devices, but once you account for a keyboard and mouse, there are no ports left for anything else.

POWERED USB HUB

This is where choosing the right powered USB hub is pretty important. Unfortunately, things are a little tricky here, too. We picked up a low-cost seven-port powered hub from the local computer store for just under \$10, but we had real trouble getting it working on the Pi. Basically, as soon as we plugged a third device into the USB chain, the Ethernet port would drop its bundle. As the Ethernet runs over the USB chain as well, we think there might be high/low speed issues yet to be resolved when using some USB hubs. In the end, we bought a second four-port powered hub and it worked perfectly.



Choosing the right powered USB is important to ensure it works with the Pi.



The Pi needs a minimum 5V/700mA DC power feed to work.

It's important that your USB hub has a decent power supply unit, too. The four-port hub came with what was claimed to be a 5V/900mA power brick. But on testing, it would've been lucky to deliver 500mA downhill with a tailwind. So again, we recommend that if you buy a hub, make sure it comes with a 5V/2A brick so that it has enough power reserves to run an external hard drive.

SD CARD BOOT DISK

The other thing you'll need is the SD card boot disk. You can buy a 2GB SD card with the basic Debian Squeeze Linux distro preloaded from Pi retailers, but that's hardly the way to do it, especially when you can do it yourself. All you need is the freeware Win32DiskImager utility and a Pi-ready distro. You can see how it's done in the step-by-step guide opposite. For now, the two simplest distros to install are the brand-new official Debian Wheezy distro you can download from the Raspberry Pi web site at tinyurl.com/76t6ekf, or our own APC piLinux for

Raspberry Pi distro available from apcmag.com/pilinux.htm.

The new official distro appeared just as we were going to press and is built on the Raspbian optimised release of Debian Wheezy. It features HFP support for the Pi's BCM2835 CPU, along with the LXDE desktop environment and mostly programming aids to build your own apps. Our APC piLinux distro is built on the previous stable Squeeze release of Debian, but comes with the Xfce desktop environment and includes word processing (AbiWord), spreadsheet (Gnumeric), web browser (Firefox clone Iceweasel) and the Omxplayer command line video player, which handles up to 1080p H.264 video playback.

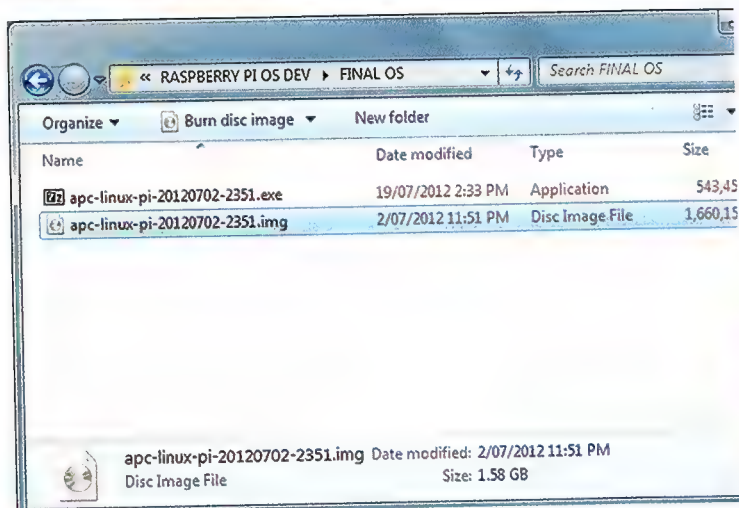
CASEWORK

While the Raspberry Pi team went for the most compact design it could, there's nothing in the way of mounting holes on the board, so you'll have to be a bit inventive about installing your Pi into a case. Unless you happen to have a 3D printer lying around, the simplest way is actually to make one out of LEGO. In fact, you can buy purpose-built LEGO cases from tinyurl.com/6rpdkap for around \$16 or if you've got kids, follow the guide at www.raspberrypi.org/archives/1354 and use your own LEGO pieces.



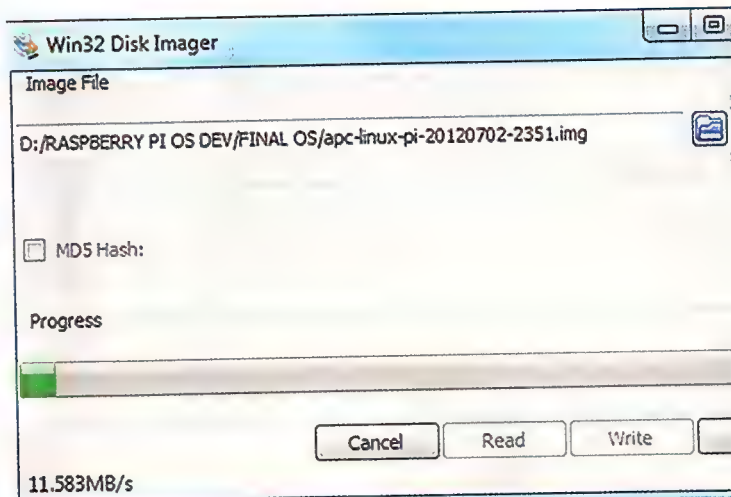
A case for the Pi can easily be created using LEGO pieces.

BUILDING YOUR RASPBERRY PI SD CARD BOOT DISK



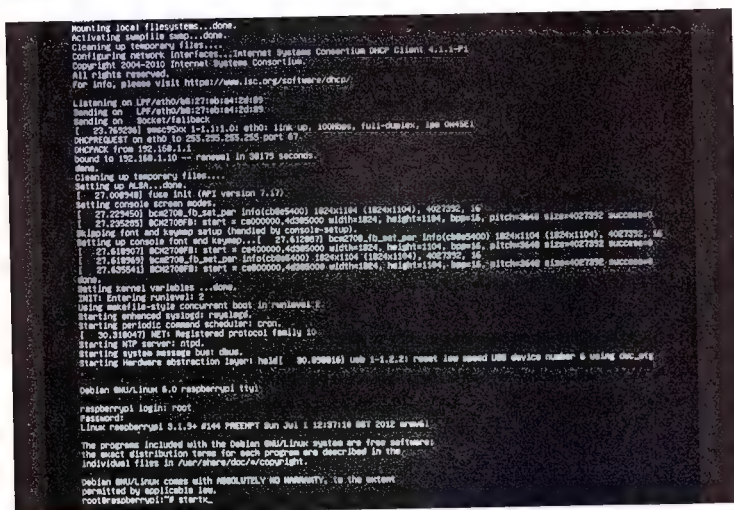
01 DOWNLOAD THE IMAGE FILE

Grab a 2GB SD card, plug it into your PC/laptop, download our APC piLinux for Raspberry Pi distro (550MB) from apcmag.com/piilinux.htm (self-extracting archive) or the official Debian Wheezy distro (440MB) from tinyurl.com/76t6ekf (.ZIP file). You'll also need Win32DiskImager from tinyurl.com/71I9vau. Unzip the Win32DiskImager archive and launch the .EXE file.



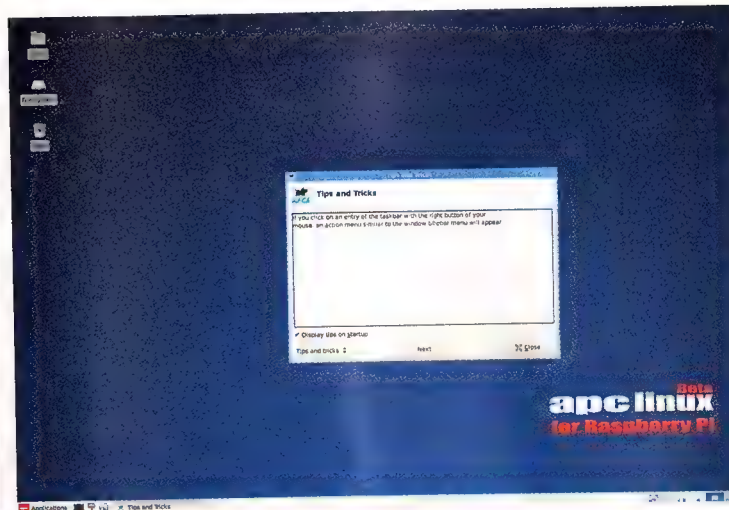
02 COPY THE IMAGE TO YOUR SD CARD

Select the .IMG file of the operating system from your saved location and select the SD card drive letter. As a warning, make sure that you select the correct drive because all of the data on that drive will be erased. Once you're ready, click the 'Write' button and the distro will be written to the SD card.



03 HOOK IT UP TO THE PI

Once the process is completed, take the card, plug it into the Raspberry Pi's SD card slot, plug in the power and it should begin booting up. Bootup time takes around 40 seconds and you'll get to the login prompt. For our APC piLinux distro, there are two username/password accounts: root / apc (admin account) and apc / magazine (user account). For the official distro, it's pi / raspberry.



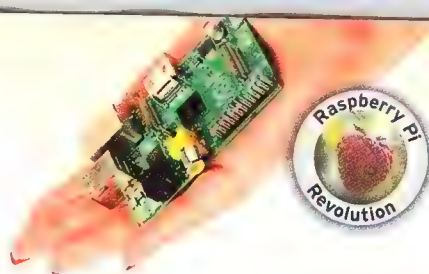
04 LOGIN & LAUNCH IT

Once you're logged in, type `startx` and the Pi will begin launching the distro's desktop environment. Once you see the desktop display, you're good to go. After this, your SD card will appear to have just 64MB capacity in Windows due to it now having two partitions. You can use Win32DiskImager to rewrite distro .IMG files to the card, but to get the full capacity back, you must delete both SD card partitions in Linux with a tool like GParted.

PERFORMANCE

If you're expecting to replace your PC with one of these, don't hold your breath. According to the Raspberry Pi team, they equate the 700MHz Broadcom BCM2835's processing performance to that of a 300MHz Pentium II – and that's a pretty fair call based on our experience.

That said, the Pi is fast enough to play *Quake III*, play back 1080p video and handle speech recognition – not bad for a \$38 computer. That it's capable of running Linux and can be programmed with the Python language means there's little doubt it'll produce more ingenious and surprising ideas in the coming months.



RASPBERRY PI: YOUR NEXT HOME THEATRE SYSTEM?

With its ability to play 1080p H.264 video, [Darren Yates](#) looks at how to set up the Raspberry Pi as a media centre.

With all the talk about smart TVs at the moment, it might surprise you just what it takes in computing hardware to add 'smart' to a TV. With the AppleTV media player selling for just \$109 and featuring a single-core Apple A5 ARM-based processor, it doesn't take as much as you might think. So with that in mind, we thought we'd take a look at whether the Raspberry Pi could do the job.

PURPOSE-BUILT LINUX

We have to admit to being slightly surprised, but the answer isn't far off being 'yes'. At the moment, there are two ways the Pi can play video with H.264 hardware acceleration: one is Omxplayer, the command line-operated video player, which we've built into our APC Linux distro; the other is a ported version of XBMC (Xbox Media Center), which started life on the original Xbox, but now runs on just about anything.

Although the Raspberry Pi has only been around for a few months, a team has ported XBMC to ARMv6 architecture and created a purpose-built Linux distro called raspbmc. It's a minimalist distro – it's only about 140MB and does nothing other than boot straight into the XBMC app, although if you throw in an Ethernet connection or your own hard drive full of movie goodies, it's good enough to turn your \$38 Raspberry Pi into a full-blown media centre.

At the time of writing, raspbmc was at Release Candidate 3 (RC3), so not quite version 1.0. It also uses a Windows download manager to grab

the operating system and write it to the SD card automatically. Sadly, we tried several times and could never get the download manager to work. However, there is an alternative: there's a prebuilt .IMG file, which you can download from tinyurl.com/bnhymrs.

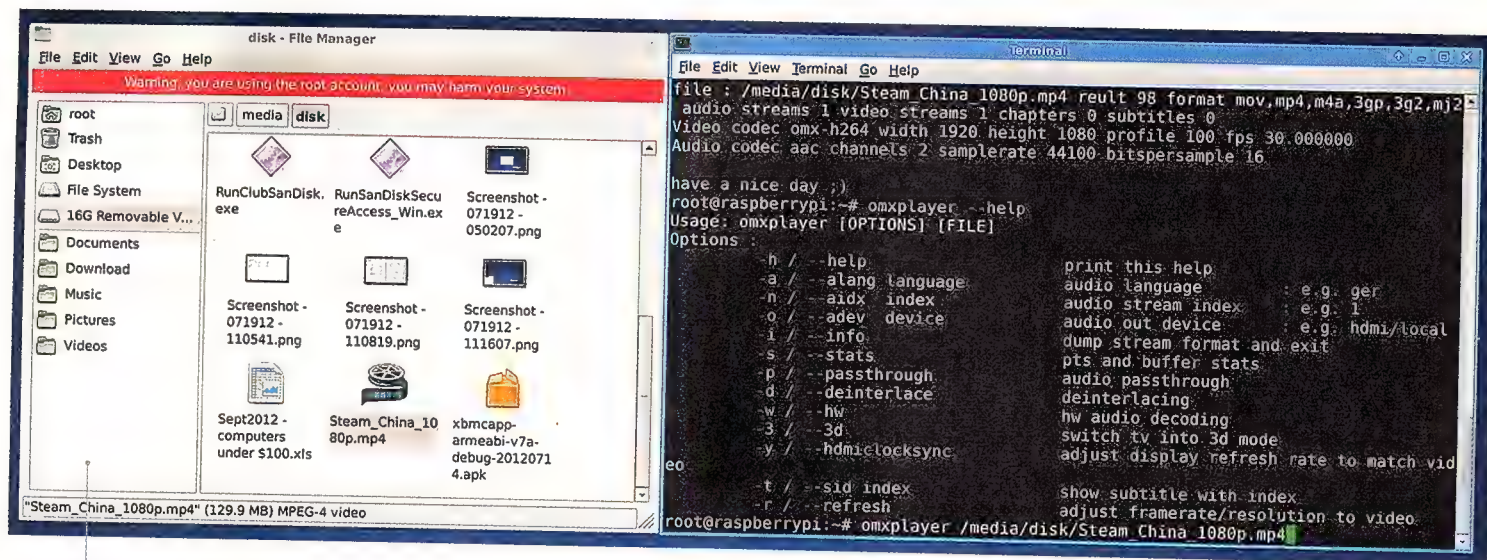
HARDWARE

The Raspberry Pi has an HDMI output so you can connect it straight to your big-screen TV. If you want a non-HDMI option, use the composite video output and a 3.5mm stereo to twin RCA cable – plug the 3.5mm stereo plug into the Pi's socket and the twin RCA connectors into your TV. To make it easier to use, we'd recommend setting the audio output level on the Pi to maximum and using your TV's remote control to set the volume.

As for accessing your movies, read the 'Making the Pi work' story (see page 52) and make sure you use a good quality four-port powered USB hub so you can run an external USB hard drive. If you have a powered USB hard drive, that'd be a good option too, lightening the load on your hub's power supply. That said, we had no trouble getting the Pi itself to run a 16GB USB flash drive on its own.

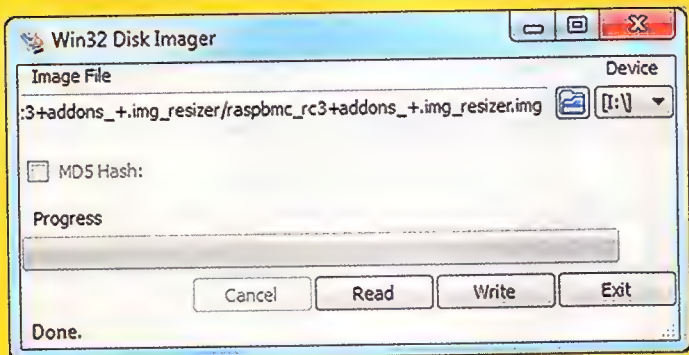
USING OMXPLAYER

The Pi will output audio through the HDMI connector using Omxplayer, but at time of writing, we could only get audio working through the Pi's

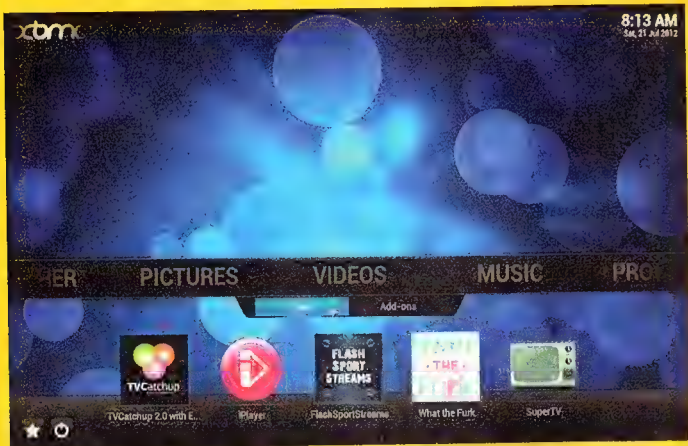


Omxplayer is basic, but will play 1080p H.264 videos on a Raspberry Pi.

RUNNING XBMC ON YOUR RASPBERRY PI



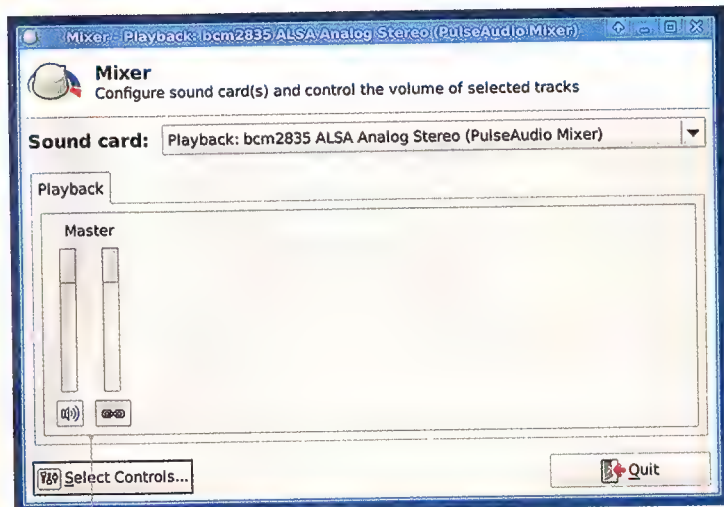
01 Download the raspbmc .IMG distro file from tinyurl.com/bnhymrs. Use WinRAR or 7-Zip to unzip it to a folder. After that, follow our guide for installing APC piLinux onto a 2GB SD card, substituting the .IMG file you just unzipped in its place.



02 When you've completed the install process, load the card into your Raspberry Pi, plug in the power and boot up. It'll start sorting itself out and within a couple of minutes, you should see the XBMC screen appear. From here, using your mouse to play a video on your USB flash drive or hard drive, select 'Videos' and click on 'Files'.



03 Follow the path to your connected USB drive and then provided the video is an H.264/MP4 format file, it should play nicely in XBMC.



Remember to set the audio controls or you won't hear anything!

headphone socket. However, it should be possible to send it through the HDMI port.

To use Omxplayer, you'll need to run the command line like this:

```
omxplayer -o hdmi /media/disk/mymoviefile.mp4
```

The `-o hdmi` switch tells Omxplayer to send the audio through the HDMI port to your TV. If you just want to use the Pi's headphone socket, leave out the `-o hdmi`. Both XBMC and Omxplayer only support H.264/MP4 video file playback, which also means stereo audio only, as surround sound multichannel isn't supported. And if your movie filename/filepath has spaces, make sure you surround the filename in quotes ('') or Omxplayer will fail.

SETTING AUDIO LEVEL & CONTROLS

In order to hear anything, you'll need to ensure that you click on the speaker symbol on the APC piLinux taskbar and load up the audio mixer. Once it's up, click on the 'Select Controls' button, check the box next to either 'PCM' or 'Master' (whichever comes up, depending on whether you choose the ALSA audio mixer or PulseAudio) and then push the audio level slider controls all the way to the top. Do this before you launch Omxplayer.

Once your video is playing, Omxplayer's playback controls are pretty basic – press P for pause and Q for quit. You can use the left and right arrow keys to jump back and forth; however, if you do this too much, Omxplayer will no longer respond. Given our deadlines, we're using a very early version of Omxplayer, although that's all that was available at the time of our build.

LIMITATIONS

Although the Broadcom BCM2835 CPU's VideoCore 4 video decoder can handle a wide array of codecs, the Raspberry Pi guys only paid for MPEG-4 and H.264 acceleration. As a result, the Pi can't play DVD content and this version of XBMC doesn't support DVD playback. That means if you have DVD movies, you'll need to rip them and convert them to Raspberry Pi's H.264 format.

Ideally, keep the video bit rate under 4Mbps if you can to avoid overloading the Pi.

MORE TO COME

As with almost everything to do with the Raspberry Pi, it's still early days for raspbmc. It's not perfect, although it has a wide array of add-ons that are available, so you can customise it to your heart's content. The interface gets a little jumpy when it starts doing tasks, but video playback is nice and smooth.

Overall, if you want to show off just what you can do with your \$38 computer, this still wouldn't be a bad place to start.



RASPBERRY PI: RESIZING YOUR SD CARD

Darren Yates shows you how to manually change your Raspberry Pi Linux distro to use your SD card's full capacity.

BUILDING YOUR RASPBERRY PI SD CARD BOOT DISK

Installing a Raspberry Pi distro .IMG file onto an SD card with just Windows is convenient, but it leaves us with a problem: the SD card capacity will become whatever the size the .IMG file is set to. For example, our APC Linux distro has the compulsory 64MB FAT32 partition and an Ext4 partition for the OS set to 1.8GB, regardless of the SD card size you use. It's just a by-product of image-based Pi distros, but one you can fix on the Raspberry Pi itself. Here's how.

02 DELETE THE PARTITION TABLE

Don't worry – this step doesn't delete the operating system. We're just rejigging the partition table to tell the OS to use the full capacity of the card. So, type:

```
fdisk -cu /dev/mmcblk0
```

Then press the Enter key. Fdisk is APC piLinux's disk partition app with its own user interface. Now type `p` and press Enter (we'll use `<enter>` in the code below). This will bring up the SD card's partition table list and you should see two entries: the FAT32 partition, followed by the Linux (EXT) partition. Now type the following code:

```
d <enter>
2 <enter>
```

```
n <enter>
p <enter>
2 <enter>
<enter>
<enter>
w <enter>
```

Here, `d` is the delete command, `2` means delete the partition 2 table, `n` says that we're about to create something, `p` means create a new partition and `2` is a new partition table for partition 2. By default, fdisk should then give us the correct start block for the new table, so we can just press Enter. It should also give us the default option to use the entire card capacity, so press Enter again. Finally, `w` tells fdisk to write the partition table out and you should be back to the Terminal prompt.

The exact distribution terms for each program are described in the individual files in /usr/share/doc/*/copyright.

Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent permitted by applicable law.

```
root@raspberrypi:~# fdisk -cu /dev/mmcblk0
```

Command (m for help): p

```
Disk /dev/mmcblk0: 32.1 GB, 32082251296 bytes
4 heads, 16 sectors/track, 979072 cylinders, total 65666000 sectors
Units = sectors of 1 = 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk identifier: 0x73d213e9
```

	Device	Boot	Start	End	Blocks	Id	System
/dev/mmcblk0p1		3048	133119	63536	c	MS FAT32 (LBA)	
/dev/mmcblk0p2		133120	320811	1876992	83	Linux	

Command (m for help): d

Partition number (1-4): 2

Command (m for help): n

Command action

e extended

p primary partition (1-4)

p

Partition number (1-4): 2

First sector (133120-65666000, default 133120):

Using default value 133120

Last sector, +sectors or +size[K,M,G] (133120-65666000, default 65666000):

Using default value 65666000

Command (m for help): w

The partition table has been altered

Calling ioctl() to re-read partition table.

WARNING: Re-reading the partition table failed with error 16: Device or resource busy.

The kernel still uses the old table. The new table will be used at

the next reboot or after you run partprobe(8) or kpartx(8)

Syncing disks.

```
root@raspberrypi:~# shutdown -r now
```

03 REBOOT & RESIZE

You'll have to reboot the Pi and you do that by typing:

```
shutdown -r now <enter>
```

This tells the Pi to shut down, `-r` means we want to reboot and `now` means do it now. When you get back to the login screen, log in as before, but don't `startx`. Instead, type:

```
resize2fs /dev/mmcblk0p2 <enter>
```

This tells APC piLinux to resize the file system for the SD card's second partition to match the partition table we just created. Again, no data changes hands – we're just writing the changes to use the full card capacity.

Now, go and have a cuppa. If you use a 32GB card like I have, it'll take around 10 minutes or so. But when it's done, type `startx` and when you've booted up into the desktop, launch Thunar file manager ('Applications > Accessories > Thunar') and you should see the free space at the bottom of the window much nearer the card capacity. If so, you're done.

```
Debian GNU/Linux 6.0 raspberrypi tty1
```

```
raspberrypi login: root
```

```
Password:
```

```
Last login: Thu Jul 19 09:05:47 UTC 2012 on tty1
```

```
Linux raspberrypi 3.1.9+ #144 PREEMPT Sun Jul 1 12:37:10 BST 2012 arm
```

The programs included with the Debian GNU/Linux system are free softw

the exact distribution terms for each program are described in the

individual files in /usr/share/doc/*/copyright.

Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent

permitted by applicable law.

```
root@raspberrypi:~# resize2fs /dev/mmcblk0p2
```

```
resize2fs 1.41.12 (17-May-2010)
```

Filesystem at /dev/mmcblk0p2 is mounted on /1 on-line resizing requir

old_desc_blocks = 1, new_desc_blocks = 2

Performing an on-line resize of /dev/mmcblk0p2 to 7815936 (4k) blocks

```
...
```


GAMING ON A RASPBERRY PI



The Raspberry Pi has a GPU and it's up for *Quake III*. **Darren Yates** shows you how to run this classic game.

The Raspberry Pi was really designed to be an educational computer to enable kids to learn how to program, although that doesn't mean you can't have some fun with it, too. It might be a long time since this game was winning awards, but *Quake III* can be played on the Pi and at decent frame rates.

At this stage there's no sound, although it'll give you an idea of just what's possible. You'll also need an internet connection on your Pi for this one. The *Quake III* source code was released to open source by game developer id Software back in 2006 and the version you'll play here is based on the demo version, so it's all legal.

STEP 1: GRAB THE DEBIAN DISTRIBUTION FROM RASPBERRY PI

We haven't got *Quake III* working on APC piLinux yet, so you'll need to download the June 19 Debian distro from Raspberry Pi at tinyurl.com/c4vzenr. Install this to your 2GB SD card using the same method we used for installing piLinux. When you're done, load the SD card into your Raspberry Pi and boot up. To log in, the username is `pi` and the password is `raspberry`. Don't launch `startx` yet.

STEP 2: DOWNLOAD OUR QUAKE III INSTALLER

The next step is to grab our *Quake III* installer script. To do that, type the following at the command prompt:

```
wget http://dl.techlife.net/apps/quake3install.sh
```

Then, launch it by typing the following:

```
bash ./quake3install.sh
```

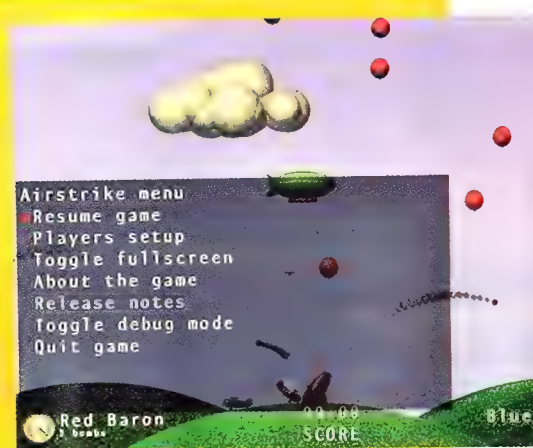
The script is a modified version created by **mitchtech.net**, which will grab all of the necessary *Quake III* game engine and demo .PAK files, unzip them and move them into the right folders. Once you get the 'Done' message, launch *Quake III* by typing:

```
cd quake3 && ./start.sh
```

After a flurry of text on the Terminal screen, it should soon go blank, flash the id Software splash screen and come up asking for a CD key. Just press the Esc key and it'll quickly drop back to the *Quake III* menu screen. *Quake III* operates via keyboard and mouse (arrow keys for direction, mouse to aim and fire) and you can adjust all aspects of the game – from controls through to game resolution – from the main menu.

OTHER OPTIONS

It's early days for the Raspberry Pi, but already, one genius has worked out how to run SNES games on the Pi and even hack the SNES game controller to run via the Pi's GPIO bus. So don't be surprised to see more of these hacks appear in the coming months.

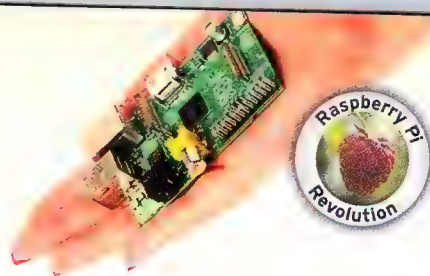


AIRSTRIKE

Quake III probably isn't the best option if you have littlies running around, so an annoyingly addictive G-rated game is *AirStrike*. It's easy to get and works in the *Quake III* Debian distro we've used here. Just launch Terminal from the Applications menu and type:

```
sudo apt-get install airstrike
```

Once it's installed, go to the main menu, select 'Games', choose 'AirStrike' and the game should launch. Like *Quake III*, it's more than fast enough on the Raspberry Pi and is only a 2.7MB download.



APC'S EXCLUSIVE RASPBERRY PI DISTRO

Darren Yates takes you on the guided tour around APC piLinux for Raspberry Pi, APC's first Linux distro.

The Raspberry Pi is an amazing little computer for the price and it will no doubt spawn thousands of cool ways to use this \$38 marvel. Rather than just review the Pi like everyone else, we wanted to go one better, so we created our own Linux distro specifically built for the Raspberry Pi.

There are a small number of Linux releases available for the Pi, but they're either function-specific like raspbmc or they're focused in a particular direction, like the education/programming focus of the new official Debian Wheezy release. Don't get us wrong – the official release with its HFP support for the Pi's BCM2835 CPU is fantastic. However, it uses the LXDE desktop environment and as a long-time fan of Xfce, I personally wanted to see if we could get something more rounded up and running. APC piLinux for Raspberry Pi is the result.

FIRST BOOT

As with most distros, the first time you boot up and type `startx` will be the slowest, as it sets itself up on the SD card. If you haven't yet, make sure you follow the instructions in 'Resizing your SD card' on page 56 to get full value from your card's storage.

We've given the Xfce4 desktop a simple APC blue background image and customised the taskbar to include our own APC 'Start' button called 'Applications'. We've also included a CPU monitor. This will be important because let's face it, 700MHz isn't a lot of clock speed to play with and some apps like web browsing will smack into the CPU performance end stops. The CPU monitor gives you a quick visual on the CPU load – if it's a solid blue block, ease up a bit on what you're doing and wait for the CPU to calm down again before doing the next task.

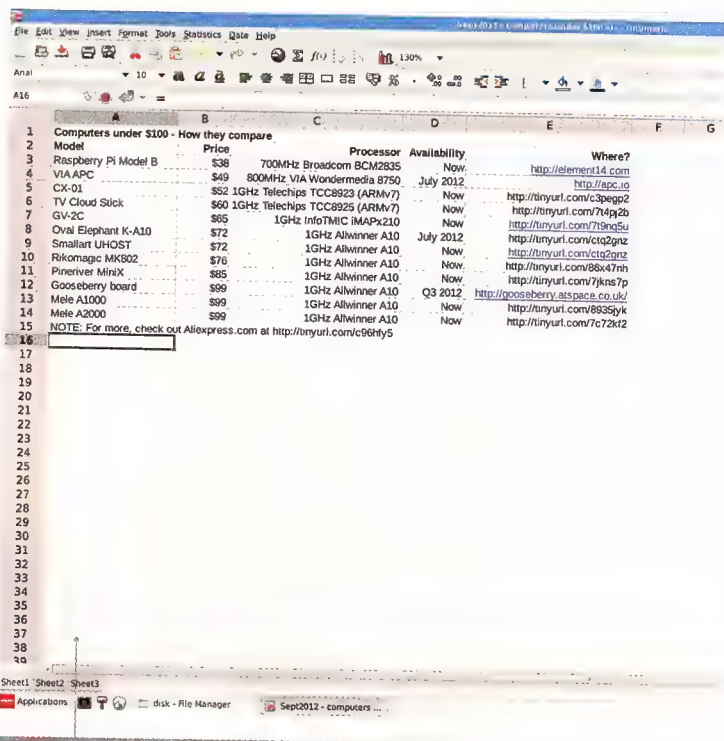
The four blocks on the taskbar will allow you to run four different desktops. That means instead of cluttering all of your open apps onto one desktop, you can move them across four and spread out, a bit like having four monitors, but without using up all that desk space.

LAUNCHING APPS

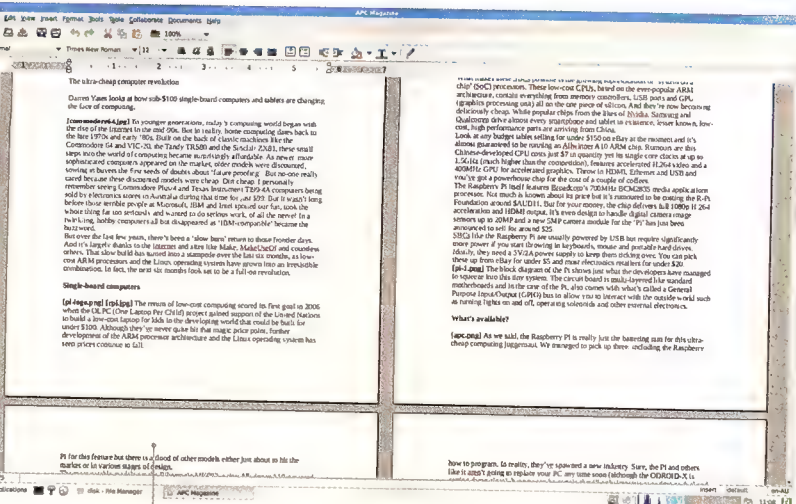
You'll find the full list of apps available in the 'Applications' menu. If you're coming from a Windows background, think of this as the old Windows 'Start' orb. You can do everything from here, including making changes to Xfce, such as changing the background image or other features of the desktop environment.

ADDING EXTERNAL STORAGE

Adding more storage to the Pi is pretty simple. If you have a USB flash drive or external hard drive, just plug it into an available port on your powered USB hub. APC piLinux will automatically find it, mount it and launch the Thunar file manager to give a look inside. Not only that, you should also get a desktop icon for your new drive. So far, we've had numerous flash drives and USB hard drives plugged in and working perfectly. Just be aware that some USB powered hubs may give the Pi

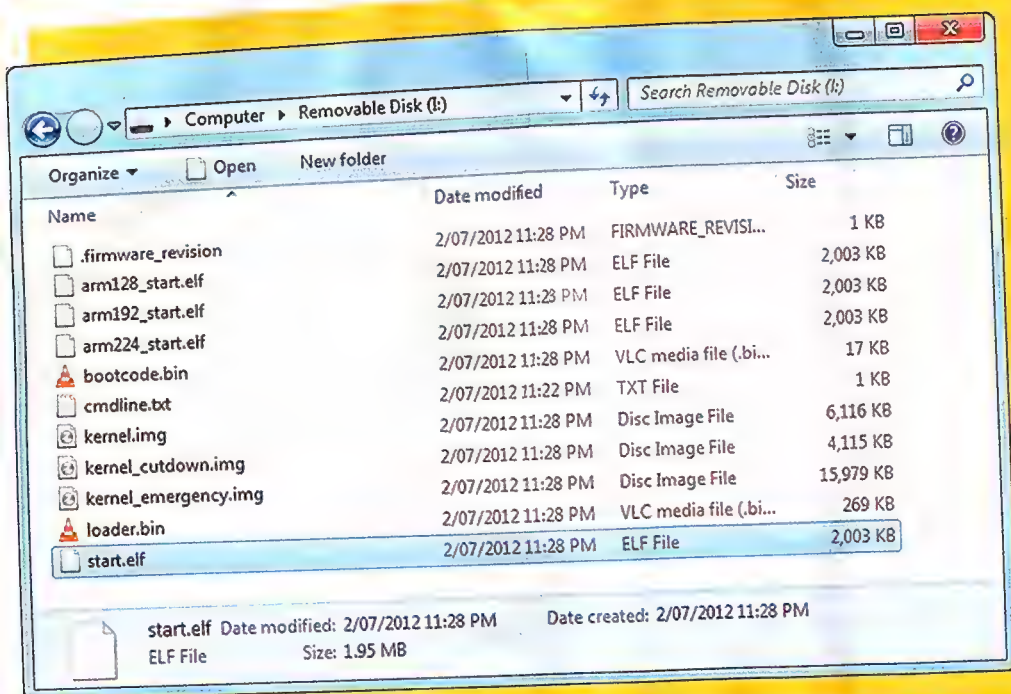


Open, edit and save Excel spreadsheets in Gnumeric.



AbiWord will open, edit and save documents compatible with Word.

The CPU monitor on the taskbar will tell you how hard the Pi is working.



CPU/GPU MEMORY ALLOCATION

The Broadcom BCM2835 CPU is unusual because it comes with a fixed 256MB cache of RAM that you can manually allocate on bootup between the CPU and GPU.

Load the SD card with APC piLinux on it into your Windows computer with Windows Explorer and you'll see the 64MB partition. Inside, you'll see four 'start.elf' files. These are the bootloaders that control that memory allocation when the Pi boots up each time.

We've set the default split to 192/64MB (CPU/GPU) because the GPU requires 64MB of memory for the video buffer in order to play back 1080p video. If you're not interested in video, you can gain a little extra speed by selecting a 224/32MB CPU/GPU split. To do that, delete 'start.elf', make a copy of 'arm224_start.elf' and rename it 'start.elf'. When you're done, plug the card back into your Pi, boot up and it'll tell you the changed RAM split.

problems and make sure your hub's power brick has the juice to run your peripherals. Also remember to unmount your drives before removing them; in Thunar, right-click the drive in the list on the left and select 'Unmount Volume' from the context menu that appears. This just ensures that any delayed writes to the drive are performed before you remove it so you don't lose any data.

If you've played with any of the UserOS Linux distros I built for PC User, you should find this one pretty similar to use. Even if you haven't, if you can use Windows, you should be able to drive this one.

INTERNET ACCESS

Getting internet access should be as simple as plugging in your Ethernet cable before you boot up. APC piLinux has DHCP (dynamic host configuration protocol) connectivity, so it will automatically interact with your network router, grab itself an available IP address and be ready to go. However, just be aware that this is probably the toughest thing you'll get the Pi to do because it's so CPU-intensive. It's even more intensive than H.264 video decoding because the CPU can offload that to its GPU to handle, whereas everything web-based has to be done by the CPU itself.

Again, the first time you launch Iceweasel will be the slowest and it will speed up a little after that.

APC PILINUX FOR RASPBERRY PI: APP LIST

Here's a quick rundown of the apps built into APC piLinux.

- File manager – Thunar
- Word processor – AbiWord
- Spreadsheet – Gnumeric
- Web browser – Iceweasel
- Media player – Omxplayer
- Disk Editor – GParted
- Image viewer – Ristretto
- BitTorrent client – Transmission

You also get access to Debian Squeeze's 25,000+ app repository through the Terminal-based apt app. Just plug the Pi into your home network and you're away.

TRY IT OUT

ARM processors are quickly becoming a viable alternative to traditional x86 processors. The Raspberry Pi won't have the legs to outpace an Intel Core i5 chip, but to get a whole computer for \$38 isn't bad going. APC piLinux aims to turn your Pi into a general-purpose computer so if you get hold of one, why not give it a spin?

FreeNet Antennas

UBIQUITI
NETWORKS

airVision

- Range of IP Cameras
- Free Management software
- Free Recording Software
- Professional features



www.freenet-antennas.com.au/airvision



RIKOMAGIC MK802: CHEAP PC IN A USB STICK

Just how small can you make an Android computer?
Darren Yates tests the MK802 to find its highlights and drawbacks.

While the Raspberry Pi has made a major splash, it's just one of a dozen or so SBCs now selling for under \$100. Another is Rikomagic's MK802, which is remarkable for being a complete Android 4.0 computer in something only fractionally larger than a USB flash drive. You'll find it on eBay from a number of vendors for around \$70.

As impressive as the Raspberry Pi is, the MK802 is even more of an eye-popper. A speedy 1GHz single-core Allwinner A10 ARMv7 processor with 1GB of DDR3 memory and built-in Android 4.0.3 operating system really gives this a surprising amount of horsepower in such a tiny package. And if that wasn't enough, it has an HDMI output plus USB host and USB power ports.

The MK802 comes with the Google Play Store, so you have over 600,000 apps to play with. Essentially, it runs like a basic Android tablet except on a much larger screen. Although it lacks Ethernet, somehow the MK802 also includes 802.11b/g Wi-Fi networking – I had no trouble getting the unit to hook into my home network.

POWER & PERIPHERALS

Like the Raspberry Pi, you'll need to throw in a powered USB hub in order to boost up the USB port numbers. But unlike the Pi, we had no trouble with either the four- or seven-port powered hubs running on this one. It also handled our 500GB USB hard drive and 32GB flash drives without trouble, and we were able to play 1080p (1,920 x 1,080-pixel) H.264 video through to the HDMI-connected monitor. As

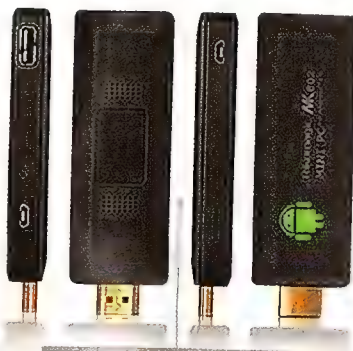
Android has no trouble operating via a USB keyboard and mouse, you don't need to worry about a fancy touchscreen.

The MK802 comes with its own DC power brick, but you should use a powered USB hub to handle external devices and ideally, a power adapter that can deliver at least 5V/1A. What's missing is Bluetooth, so don't bother trying to pair up a Bluetooth keyboard or mouse.

DRAWBACKS

Unfortunately for the MK802, there's also something else missing. As impressive as this little unit is, the designers failed to include ESD (electrostatic discharge) protection in the form of pull-down resistors on the HDMI output. In theory, the MK802 could possibly blow its HDMI output if there's a sufficient electrostatic charge build-up on the connector. It could also pop the HDMI input on your monitor or TV. That said, I used the unit for about a week with no trouble (other than getting a little warm playing 1080p video), but I think the trick will be not to pull out the HDMI cable while either the MK802 or the TV is powered up. There's no guarantee, but our review unit didn't miss a beat during testing. I'd personally have no qualms hooking this up to a basic \$150 HDMI monitor, but I'd probably think twice about using it on a \$5,000 60in LED TV.

That said, things move quickly – a replacement for the MK802 called the MK802 II/Oval Elephant fixes this ESD issue along with the missing A10 CPU power regulator chip. The Oval Elephant has just gone on sale for US\$73 online with first shipments expected on July 20.



An Android 4.0 computer the size of a USB flash drive.

TURN THE MK802 INTO A WI-FI SERVER

Darren Yates turns this tiny USB stick computer into a Wi-Fi file server fast enough to stream videos.

Network-attached storage (NAS) boxes are popular ways to add simple storage to your home network but until very recently, most were powered by ARM processors running custom-built Linux distros. Given that's all the MK802 is, it won't be hard to turn this computer in a stick into a decent wireless file server.

Thanks to its built-in 802.11b/g wireless networking, the MK802 has the most important feature we need already built into it. By adding a powered USB hub to handle a portable hard drive, the only other thing we need is to add software to enable the MK802 to start serving up our files.

STEP 1: GRAB SAMBA FILESHARING

The first thing to do is head to the Google Play Store and download Samba Filesharing. I absolutely love this app because it gets rid of the difficulty of getting Windows and Linux (that's essentially what Android is) talking together over a network. Normally, you need a rooted device, although the MK802 isn't locked, so Samba Filesharing installs straight in and is ready to go in just a couple of minutes.

STEP 2: SET UP NETBIOS NAME, LOGIN & PASSWORD

To get Samba working, you need to go into the menu, select 'Settings' and choose a username and password to give your files a modicum of protection, as well as the NetBIOS name (the server name you'll see from other clients on the network).

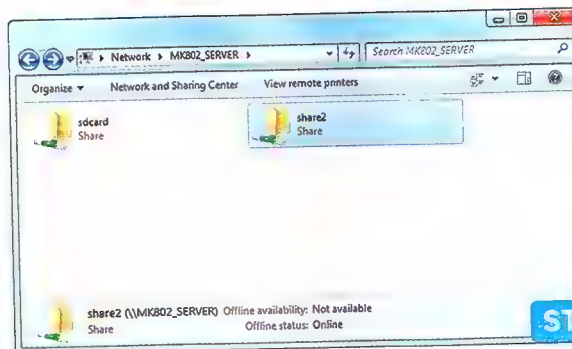
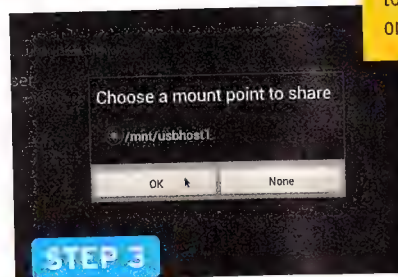
STEP 3: SHARE YOUR EXTERNAL USB DRIVE

What's great about the latest version of Samba Filesharing is that it now supports sharing a second storage device. The MK802 has around 2.2GB of its 4GB built-in flash memory available for use, but connect a 500GB USB hard drive into the MK802 and you can set it to become the second shared device. To do this, first make sure your 500GB hard drive is formatted to FAT32, plugged in and mounted into the Android operating system. Then, go to



TURNING SAMBA ON & OFF

On your MK802 Samba main screen, just click the big 'Samba' text at the top – it's a toggle button and allows you to quickly turn Samba on and off.



Samba's 'Settings' screen again, select 'Other Fileshare Settings' and click on 'Second Shared Folder'. When you do, you should see a pop-up box with an option to select your USB hard drive. Do so and click the 'OK' button.

STEP 4: CONNECT VIA WINDOWS EXPLORER

Head to your Windows PC client, go to 'Network' in Windows Explorer and choose your server. Then, type in the username and password you created

in step 2 when prompted and you'll have access to your files.

The Rikomagic MK802 has enough speed to handle what I call passive streaming, which is basically file serving. If you have a 1080p video on your USB drive, you should be able to play it over an 802.11g-grade wireless network on your PC through your favourite media player. I don't know about you, but I can't help being amazed that a \$70 USB stick computer can actually do this.

MK802 WIRELESS MEDIA PLAYER

Darren Yates explains how to transform the MK802 into a wireless network media player using free apps.

One of the most useful features inside the MK802 is the 802.11b/g Wi-Fi adapter. Unlike the Raspberry Pi, you can place this device almost anywhere in your home and still get network connectivity. With Google TV arriving in Australia, Android is starting to see huge growth in home entertainment, but our first look at Google TV revealed the Australian version has no built-in media player yet. Well, here's how to get the MK802 playing videos over your wireless network from your PC storage.

STEP 1: GET THE APPS

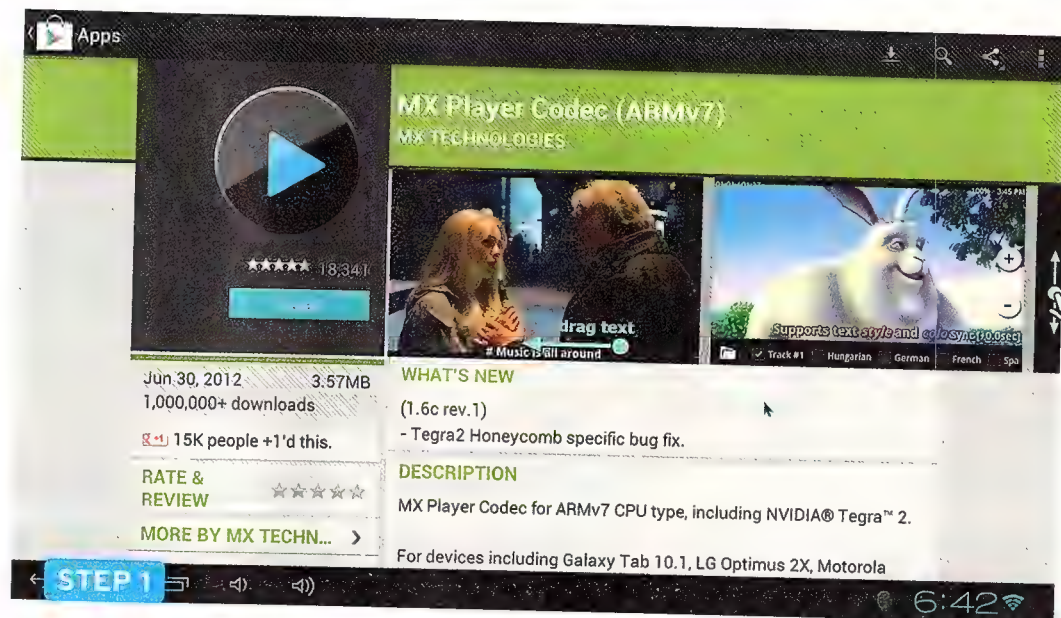
The first thing you need is to grab ES File Explorer and MX Player from Google Play. Both are free and offer must-have features – ES File Explorer has built-in Windows network access and MX Player is a great video player with H.264 hardware acceleration and multicore CPI support. Grab the MX Player Codec (ARMv7) pack, too – add this and MX Player will handle just about every video format under the sun.

STEP 2: SET UP YOUR PC

Set up your video library on your PC. The simplest option is to load your videos into the 'Public Videos' folder, which already has shared access. You could also choose your own folder – you just need to make sure you share it so it can be accessed by the MK802.

STEP 3: LAUNCH ES FILE EXPLORER

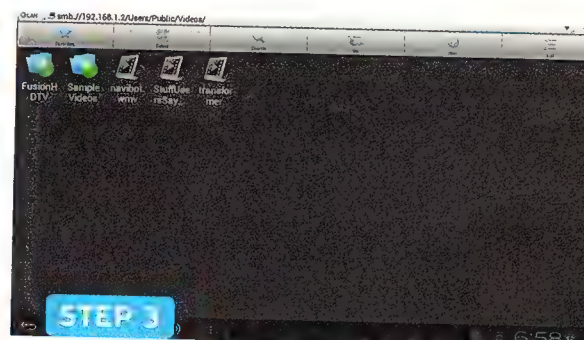
To get ES File Explorer to see your Windows PC, you need to get it to scan the network first. Click the button at the top-left corner and select 'LAN'. If you're not already told to, press the 'New' button and select 'Scan'. ES File Explorer will search and list



the IP address of computers on the network. Click on the one holding your videos and you should see the shared folders available. Navigate to the location of your videos and select one. Because the MK802 has a couple of video players on board, you should see a file association pop-up asking you to select a video player to play the file. Select

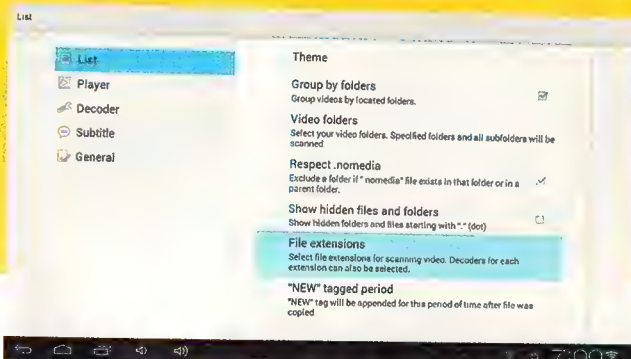
'MX Player' and within a couple of seconds, the file should begin playing.

The reason we don't use MX Player directly is that while it can play video directly from the web via HTTP, it doesn't have a network file manager. With ES File Explorer and file associations with MX Player, it's almost the same thing. **ATC**



ADDING NEW VIDEO TYPES

The thing we love about MX Player is that you can add new video file types to its list. For example, if you have digital TV recordings from a set-top box with extensions .TRP, .001, .002 and so on, click on the top-right menu icon on MX Player, select 'Settings > File Extensions' and click the 'Add' button. Type in the new file extension you want MX Player to recognise, choose whether you want hardware (H/W) or software (S/W) decoding and click the 'Save' button. Provided you've installed the video codec pack, MX Player will then play these MPEG-TS digital TV files.



GIGABYTE™



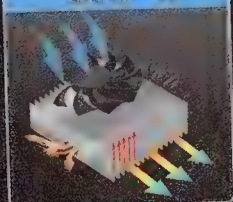
Super Cool! Super Quiet!

WINDFORCE
ANTI-TURBULENCE COOLING

TRIANGLE COOL

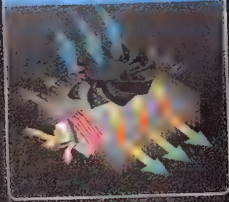
- Patented triangle-shaped combination of fins & clip module
- Guarantee 35% cooler than transitional linear solution fansink

93.2 °C

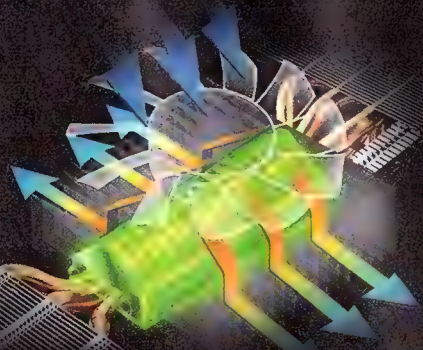


Without
"Triangle cool"

68.5 °C



With
"Triangle cool"



GIGABYTE WINDFORCE SERIES

★ **GV-R797OC-3GD**

▶ **APC Highly Recommended Award** ◀

- New WINDFORCE™ 3X Cooling Design with "Triangle Cool" Technology
- World's first 28nm GPU
- Core/Mem clock: 1000 (std 925) / 5500 MHz
- Ultra durable VGA High Quality Components



GIGABYTE WINDFORCE SERIES

★ **GV-R795WF3-3GD**

▶ **PC User Best Buy Award** ◀

- NEW WINDFORCE™ 3X Cooling Design with "Triangle Cool" Technology
- World's first 28nm GPU
- Core/Mem clock: 900 (std 800) / 5000 MHz
- Ultra Durable VGA High Quality Components



*With an ambient temperature of approximately 24°, all testing ran under FurMark

www.gigabyte.com.au

IVY BRIDGE CPU BUYER'S GUIDE

Know which Ivy Bridge is the best value for gaming or video editing?
Darren Yates benchmarks Intel's third-generation Core i-series chips to find out.

The CPU market for desktops has pretty stable and well-signposted demarcation lines these days – Intel chips outclass AMD's Bulldozer on raw processing while AMD offers noticeably better 3D-ready integrated GPUs. But as always, there isn't just one choice of Intel chip if you want to go in that direction. At last count, there were around 15 different Ivy Bridge chips for just the desktop alone, with more to come.

CORE, CLOCK, CACHE

It's a catchcry we've used before, but it still holds true: Intel's various processor offerings are built on simply mucking around with the three Cs: core count, clock speed and cache memory. And given the current point of the Ivy Bridge cycle, the chip giant has yet to release its entry-level offerings. Intel always leads off a new product cycle with its bleeding-edge products (currently, the Core i7 chips), followed by its more affordable performance parts (Core i5s) and finally, its entry-level chips (Core i3s).

In all that, though, the actual differences between the top-of-the-line CPU and the wooden spoon chip is simply how many cores inside the processor are switched on, the clock speed it's set to and the amount of cache memory inside it. Not every chip represents great value for every buyer – it all depends on what you intend to do with it.

We lined up five current mainstream Ivy Bridge CPUs – the top-drawer Core i7-3770K, the Core i5-3570K, plus the Core i5-3550, i5-3470 and i5-3450 processors – and ran them through our performance tests as well as three gaming benchmarks coupled with an Nvidia GeForce GTX 670 graphics card.

THE DIFFERENCES

As the five mainstream Ivy Bridge options, we can break down the major differences into just five points.

- The Core i7 has four cores, each hyperthreaded for a notional core count of eight, whereas the Core i5 series has no hyperthreading.
- All four Core i5 chips have the same cache amount (6MB) and the same core count (four).
- Each of the five chips is separated by 100MHz steps in both the standard and Turbo clock speeds.
- The i5-3500 and i5-3700-series chips have a slightly faster Turbo graphics speed (1,150MHz) compared with the i5-3400 series (1,100MHz).
- The two K-series chips have their multipliers unlocked for overclocking.

PRICE

The final part of the equation is pricing and this is equally as important as overall performance results, especially if you're working within a budget.

If money's no object, then it's fine to go straight to the top drawer. By comparing price versus performance, you'll find out just where the optimum value lies. So let's take a look at two main application areas: gaming and video editing.

GAMING PERFORMANCE

If you're a serious gamer, the usual temptation is to cough up your credit card and point to the top-of-the-line processor and graphics card. While it's an expensive way to go, you're not usually going to go too far wrong. But if the budget isn't open-ended, then what?

The thing to remember is that gaming speed is a function of both the CPU and the graphics card. The higher up in gaming resolution you aim for, the more the graphics card takes over the workload. The GTX 670 is no slouch – you're looking at around \$450 for one of these on the street and even at 1080p, there isn't a game this card won't cut a decent swathe through. But does the GTX 670 really need a Core i7-3770K processor to get it hitting its performance end stops? The answer is within 10% of being 'no'. Let me explain what I mean.

Look at the results table on page 66 for the *Crysis* and *DiRT 2* tests, and you'll see that for both 1,024 x 768-pixel and 1,920 x 1,080 resolution settings, the difference between the bottom-end Core i5-3450 and the top-drawer Core i7-3770K is, on average, around 10%. If we just look at the 1080p results (what we're really more interested in), the i5-3450 delivered 81.6fps on *Crysis* and 167.8fps on *DiRT 2*, while the i7-3770K returned 89.33fps and 188.16fps, respectively, for the same tests. However, if you look at the *Aliens vs Predator* results, the frame rates are all but identical. The difference in CPU price is significant – it's \$200 for an i5-3450 and \$360 for an i7-3770K.

WHICH CHIP FOR GAMING?

If you've got a budget of up to \$650 to play with for the CPU and graphics card, going for the entry-level quad-core Core i5-3450 processor and coupling it with a GeForce GTX 670 graphics card is still going to net you seriously good 1080p gaming performance.

However, look at the street pricing of the five chips we tested and you can see that only \$40 separates the four Core i5 chips, yet there's \$120 to reach the Core i7-3770K. If we're talking overall value rather than raw performance the Core i5-3570K, with its potential overclocking, is arguably the best option for adding extra future life to your system, provided you're prepared to overclock the chip to get that extra speed.

In the end, it all comes down to how much money you've got to throw at your system build. It's highly unlikely you'll get better value spending more than \$450 on current-generation graphics cards, so if your budget is up to \$650, the Core i5-3450/GeForce GTX 670 CPU and graphics card combo would be my tip. If you can push the budget to \$700, up the CPU



to a Core i5-3570K processor rather than buying a faster graphics card – the CPU will pay you back on your next graphics card purchase.

VIDEO EDITING PERFORMANCE

Video editing is a little more complicated to work out because it really depends on the software you plan to use and the video codecs you're going to work with.

If you're simply ripping DVD/Blu-ray movies and turning them into .MKV files for your network media player, there's some (but not a great deal) benefit to using a Core i7-3770K. Don't be sucked in by the Hyper-Threading extras in the Core i7 processor. If you're using any freeware app based around the FFmpeg encoding engine, Hyper-Threading doesn't make as much of a difference as simply having four fast cores going at it hammer and tongs.

Our UserBench Encode HD test is built around FFmpeg, with the main score referenced against a 2GHz Pentium 4 desktop PC as 10. If you compare the i5-3570K and i7-3770K chips at standard clock rates, the i5-3570K scores 102 and the i7-3770K only hits 110. Since the benchmark has multicore support, it shows that once you've got those four cores going hard, there's not much of a difference between the Core i5-3570K and the i7-3770K. The beauty of the i5-3570K is that it's unlocked, so you can crank up the standard Turbo clock maximum from 3.8GHz to 4.5GHz and get a decent performance gain, as you can see in the results.

ADOBE PREMIERE & CUDA PERFORMANCE

Throw Adobe Premiere CS5, CS5.5 or CS6 into the mix and having an Nvidia graphics card under the bonnet changes things.

POWER CONSUMPTION

There's this unwritten rule that says desktops are thirsty and draw far more power than laptops. Actually, it's not as true as it used to be. We measured the average AC power consumption with our test system resting on the Windows desktop as well as the peak power draw during the 1080p test of *Aliens vs Predator*.

Our figures are approximate, but they show that at standard clock ratings, the desktop system with its GeForce GTX 670 graphics card, 4GB of DDR3-1333 RAM and 120GB SSD consumed between 69 and 88W. Throw in the monitor and you're looking at around 90 to 110W – for a quad-core desktop computer, that's pretty lean. Not surprisingly, the peak power draw during our 1080p gaming test shot up to around 260W. By the time we overclocked the Core i5-3570K processor, total system power draw on the same gaming test fell just short of 300W.

While it sounds like a lot, what this actually means is that a good-quality 550W power PSU should be more than enough for any single-GPU gaming setup using an Ivy Bridge CPU.



Premiere supports Nvidia's CUDA GPU acceleration via its Mercury Playback Engine (MPE), but to make it work, you need a CUDA-ready graphics card with at least 896MB of graphics RAM.

However, MPE doesn't work on every Premiere feature, so for those features that aren't MPE-ready, the CPU still has to do the number crunching. Still, if you're using Adobe Premiere for serious video editing, using an Nvidia CUDA card would have to be a worthwhile option.

WHICH CHIP FOR VIDEO ENCODING?

For raw CPU performance, obviously the Core i7-3770K is currently as fast as you'll get, no question. But if you want the best-value option, that's going to be the Core i5-3570K. Its video encoding performance levels are slap bang in between the i5-3450 and i7-3770K; however, in terms of price, it's only \$40 more expensive than the i5-3450 and \$120 cheaper than the i7-3770K. If you're prepared to overclock it, you'll get much closer to the i7-3770K without spending the money.

OVERALL VALUE

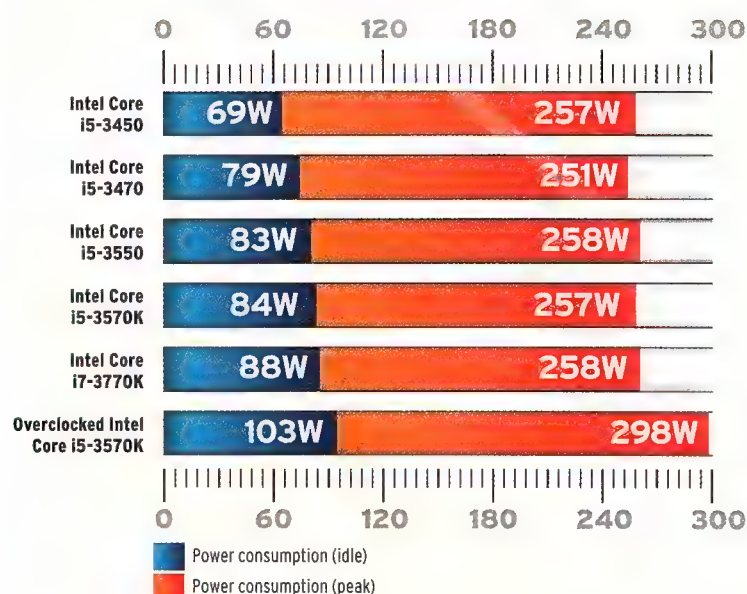
If you're prepared to bash the daylight out of your credit card, it's pretty easy to get great overall performance levels. But by comparing application-targeted performance test results with price, you'll often find that the best-value CPUs rarely come straight out of the top drawer.

CHIP SUPPLIERS

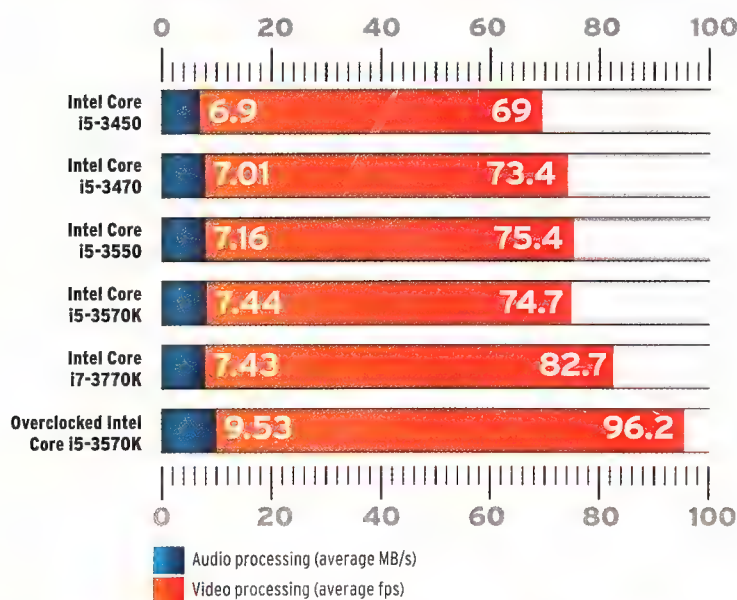
Thanks to Intel (www.intel.com.au) and TI Computers (www.ticomputers.com.au) for supplying the CPUs used for this story.



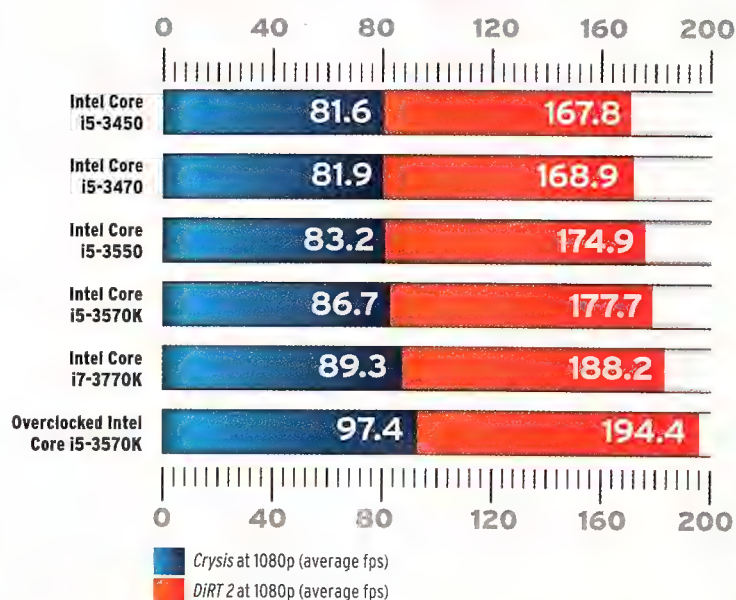
POWER USE



ENCODING PERFORMANCE



GAMING PERFORMANCE



INTEL IVY BRIDGE CPU PERFORMANCE

	Street price	Clock speed: standard/Turbo (GHz)	Number of cores	L3 cache memory (MB)	UserBench Encode HD (score)	Audio group test results (min:sec/MB/s)	Video group test results (min:sec/fps)	UserBench Image 2 (score/min:sec)	Gaming results^			Power consumption (watts)	
									Crysis: 1,024 x 768/1,920 x 1,080	DiRT 2: 1,024 x 768/1,920 x 1,080	Aliens vs. Predator: 1,024 x 768/1,920 x 1,080	Idle (Windows desktop)	Peak (Aliens vs. Predator, 1080p)
Intel Core i5-3450	\$200	3.1/3.5	4	6	94.43	0:26/6.90	1:48/68.97	89.68/1:49	93.94/81.61	182.84/167.77	194.3/97.7	69	257
Intel Core i5-3470	\$210	3.2/3.6	4	6	99.52	0:26/7.01	1:42/73.37	95.09/1:43	95.37/81.85	186.39/168.92	194.5/97.7	79	251
Intel Core i5-3550	\$220	3.3/3.7	4	6	102.14	0:25/7.16	1:39/75.39	97.76/1:40	93.66/83.24	186.54/174.85	194.0/97.7	83	258
Intel Core i5-3570K	\$240	3.4/3.8	4	6	102.16	0:24/7.44	1:40/74.67	98.75/1:39	98.44/86.67	181.39/177.65	194.4/97.5	84	257
Intel Core i7-3770K	\$360	3.5/3.9	8*	8	110.78	0:24/7.43	1:30/82.72	107.59/1:31	104.07/89.33	207.60/188.16	193.0/97.6	88	258
Overclocked Intel Core i5-3570K	\$240	3.4/4.5	4	6	131.44	0:19/9.53	1:17/96.18	122.17/1:20	111.64/97.37	198.35/194.41	195.3/98.1	103	298

* Quad-core with Hyper-Threading. ^ All gaming results in average fps.

BUILDING A FOUNDATION FOR IVY BRIDGE

Need a board to accompany your new Ivy Bridge chip? **Bennett Ring** proves you don't have to spend a fortune with these budget and mid-range options.

As with any new Intel launch, the arrival of the Ivy Bridge third-generation Core i processors comes with a confusing plethora of new motherboard chipsets, known collectively as Intel Series 7. For once this isn't a mandatory upgrade, with Ivy Bridge surprisingly compatible with older Series 6 boards, yet this incremental platform upgrade does bring a few appealing goodies to the table.

Unfortunately, a large performance boost for CPU-centric duties isn't one of them – these new boards deliver comparable performance to the last generation. However, the arrival of USB 3.0 has theoretically improved external transfer speeds by 1,000% compared to USB 2.0; we just wish Intel had delivered more than the two ports that are the default. Ditto with SATA connectivity, with a total of four SATA II (3Gbps) and two SATA 6Gbps ports.

With the arrival of compatible video cards, PCIe 3.0 is also finally included in the Series 7 boards, a feature that sounds great on paper, but doesn't actually make a lot of difference in the real world. Legacy users should be aware that PCI slots have been removed on most Series 7 parts, with the exception of business and corporate boards.

Thankfully, though, motherboard makers have reintroduced them on most products.

A range of software options are also included with Series 7, including Intel Rapid Start Technology, Intel Smart Connect Technology and Intel Rapid Storage Technology. Display output options have been given a nice upgrade, now supporting up to three simultaneous displays over HDMI, DisplayPort or DVI, on the proviso that two are connected via DisplayPort. Finally, Thunderbolt connectivity is an optional extra if you're willing to pay the ridiculous cable and device costs.

We put the call out to the major manufacturers to submit Series 7 boards in three different categories: budget, mainstream and performance. To our surprise, most of them used the premium Z77 chipset, the most potent of the (frankly staggering) 12 different Series 7 variants, with a couple of exceptions.

BUDGET IVY BRIDGE BOARDS

DIGI POWER DESIGN
USING 4 + 2 POWER
PHASE DESIGN

64MBIT AMI UEFI LEGAL
BIOS WITH GUI SUPPORT
PCI-E X1 GIGABIT LAN
10/100/1,000MBPS

\$110

ASRock H77-Pro4/MVP

Don't let the price tag fool you.

@ www.asrock.com

✓ Solid performance, 3 x PCI slots, two extra SATA 6Gbps ports.

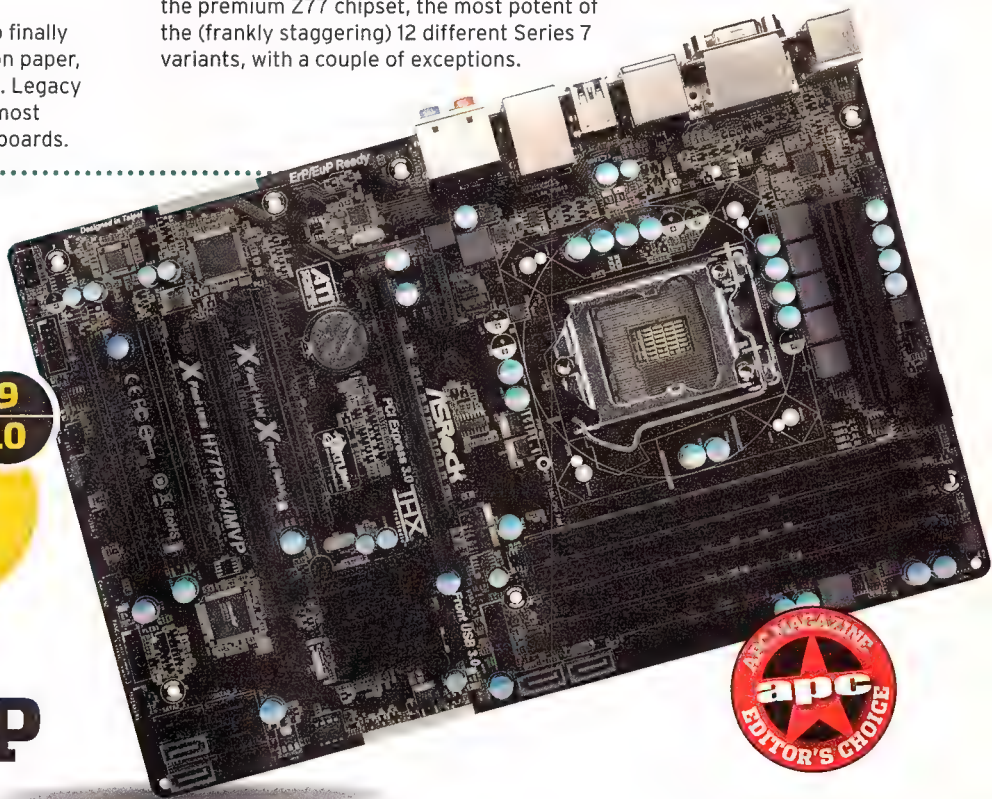
✗ Thin PCB material, no DisplayPort out.

This is one of the few boards here to use the cheaper H77 chipset. The major difference is a single x16 PCIe 3.0 lane that can't be split across two PCIe slots, but even when utilising this board's SLI and CrossFire capabilities, we doubt you'll notice any difference. It still packs the usual Intel quad SATA 3Gbps and dual SATA 6Gbps ports, but ASRock has added two more SATA 6Gbps ports powered by an ASMedia chip.

Legacy users will love the inclusion of three PCI slots, making this perfect for those bringing older components to their new PC. Despite the board only officially supporting DDR3 up to 1,600MHz, we had no

problems setting the memory to run at 1,800MHz. Video output is limited to HDMI, DVI and VGA, which means you'll be limited to two monitors if using onboard graphics, while optical S/PDIF and five 3.5mm stereo mini jacks pipe out sound created by the onboard Realtek ALC892 chipset.

This H77-powered board posted some decent results in our tests, besting more expensive boards in almost all of our benchmarks. As one of the cheapest boards in our roundup, it offers excellent value for money. As usual, ASRock hasn't scrimped on the features, making this perfect for budget users who demand solid performance.



i DVI-D, VGA AND HDMI OUT
10 X USB 2.0 AND 4 X USB 3.0
DUALBIOS 2 X 65MBIT FLASH AMI EFI BIOS

\$110

**9
10**

i SUPPORTS FOUR DDR3 DIMMS UP TO 2,800MHZ
HDMI, DVI-D AND VGA
8-CHANNEL AUDIO WITH JACK SENSING

\$139

**7
10**

Gigabyte GA-Z77M-D3H-MVP

It doesn't get much cheaper than this.

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✓ Amazing performance, incredibly cheap, dual AMD video card compatible.

✗ Lack of PCI/PCIe slots, rudimentary audio and networking.

It's remarkable that Gigabyte can deliver a motherboard with a street price under \$100, yet it still packs Intel's best Socket 1155 chipset, the Z77. It's obviously had to cut some corners and the easiest way is to shrink the board size, so Gigabyte has gone for the micro-ATX format.

Understandably, this severely cuts back on your PCI/PCIe options, but amazingly there's still room for dual PCIe video cards. However, the board strangely only supports CrossFire, not SLI. There's also a PCI and PCIe x1 slot, making this a great little board for a souped-up HTPC or LAN box. Gigabyte has stuck with the default four SATA 3Gbps and two SATA 6Gbps ports of the Z77 chipset, but it's doubled the number of USB 3.0 ports to four. At this price point we can forgive the use of a cheaper Atheros network controller, which drives a single Gigabit Ethernet port. Likewise with the affordable audio solution, VIA's budget VT2021 offering, which is paired with HDMI out and three 3.5mm stereo mini jacks.

Tweakers will likely find the power solution underwhelming, with no mention from Gigabyte about how many phases this board uses. In other words, it's strictly designed for vanilla voltages. However, the board is equipped with quality capacitors and MOSFETs that Gigabyte claims have a 50,000-hour lifespan, so it hasn't scrimped entirely on the energy solution.

Despite the rock-bottom pricing, this board performed well in our benchmarks, placing smack bang in the middle of our results. If you want a bargain board, you could do a lot worse than the GA-Z77M-D3H-MVP.

MSI Z77A-G43

Who turned the speed down?

@ au.msi.com

✓ Solid audio solution; wide range of PCI/PCIe slots.

✗ Lacklustre performance at default settings; only three USB 3.0 ports.

With the Z77A-G43, MSI offers a whole lot of board at a rather attractive price. It's a full-sized ATX board powered by Intel's premium Z77 chipset, so just how has MSI managed to keep the price so competitive?

We were very surprised to see passive heatsinks on the power phases, despite there being no mention in the specs about how many phases are delivered to the CPU. These are all built using solid capacitors and super ferrite chokes. Despite this claim, the PCB didn't feel quite as sturdy as Gigabyte's offerings. There's a healthy range of slots, with dual PCIe full-length slots ready for SLI/CrossFire, two PCIe x1 and three legacy PCI slots. MSI has stuck with the standard Z77 SATA configuration of dual SATA 6Gbps and quad SATA 3Gbps ports, but has only added one extra USB 3.0 port, delivering a total of three. However, MSI has thrown in a 'gaming device port', which uses gold plating to supposedly improve mouse responsiveness. We didn't notice any difference in the real world.

The Realtek ALC892 audio chip offers better audio comparable to the VIA solution on Gigabyte boards, and it's THX certified. Audio is delivered courtesy of six 3.5mm stereo mini jacks or the HDMI out, a rarity at this price point. Realtek has also delivered the Ethernet controller in the form of an 8111E chip – it's decent, but not quite Intel good.

While the feature set is admirable, the same can't be said of the default performance. Posting speeds 10% slower than the best, we think it'll require a little bit of tweaking to bring out this board's full potential. That's fine for enthusiasts, but mainstream users who don't want to tinker might find the performance drop a bit of a turn-off.



MID-RANGE IVY BRIDGE BOARDS

- i** PCIE X1 GIGABIT LAN
10/100/1,000MBPS
- 7.1-CHANNEL HD AUDIO
WITH CONTENT PROTECTION
(REALTEK ALC898)
- 64MBIT AMI UEFI LEGAL
BIOS WITH GUI SUPPORT

8
10

\$199



ASRock Z77-Extreme6

A mainstream board for enthusiasts.

- @ www.asrock.com
- ✓ Triple video card compatible, capable overclocking options, built to last.
- ✗ Average default performance, expensive for mainstream users.

Coming in at \$50 less than the cut-off price of \$250 for our mainstream boards, it's obvious that this fully-featured Z77 beast is aimed at the upper end of the segment.

The inclusion of three full-length PCIe slots here allows for triple SLI or CrossFire setups for those with more money than sense, while the 8+4 power phase design targets the enthusiast overclocker. The board is festooned with gold capacitors, which ASRock claims will last much longer than the cheap fodder that's usually found on most mainstream boards.

Display outputs have also been beefed up. Alongside the usual HDMI, DVI and VGA out is a single DisplayPort. USB 3.0 connectivity is also increased, with a maximum of five when the front header is utilised. SATA 6Gbps ports have been doubled, with four in total, while another four SATA 3Gbps ports are the norm for the Z77. Tweakers will find the power, reset and clear CMOS buttons very convenient, while a POST code LED readout helps diagnose hardware failures.

Considering the wealth of tweaking features, we were very surprised to see this board perform towards the back of the pack when set to default values. However, these results should be taken with a grain of salt, as it's likely ASRock has disabled any factory overclocking to make tweaking simpler.

Power users looking for a very affordable solution will find a lot to love here, but it's going to take a little bit of tweaking to get the board to perform on an even keel with its competitors.

- i** 6 X USB 3.0 PORTS +
10 X USB 2.0 PORTS
- 4 X SATA II + 4 X
SATA 6GBPS PORTS
- HDMI, DISPLAYPORT,
DVI AND VGA OUT

9
10

\$230



ASUS P8Z77-V

Not quite mainstream, not quite enthusiast.

- @ www.asus.com.au
- ✓ Excellent network connectivity, triple video card ready, comprehensive feature set.
- ✗ Expensive, factory overclock might deter some.

Like the ASRock motherboard at left, this Z77-based ASUS product is right at the upper end of what could be considered a mainstream board. As such it's loaded with features aimed at the performance niche, which are likely to be overkill for an ordinary desktop.

There are three full-length PCIe lanes, which are identical to the ASRock board, and similarly only two will operate at PCIe 3.0 speeds if all three are in use. However, the option for triple video cards is there if you have the inheritance to use it.

Unlike most boards in the roundup, ASUS has also included a single-channel 802.11b/g/n wireless adapter, alongside the high-quality Intel Gigabit Ethernet port, making this one of the best boards when it comes to network connectivity. Eight-phase power should deliver decent overclockability, while two legacy PCI slots will undoubtedly prove handy alongside the healthy range of PCIe slots.

With the BIOS left at its default settings, the P8Z77-V enables a few features that could actually be seen as minor factory overclocks, which accounts for the excellent performance results. ASUS claims they introduce no instability, although they can all be disabled in the BIOS if you so choose.

With top-tier performance and features, we can understand why ASUS is charging a premium for this motherboard. If you're simply building a machine for email and web browsing, the P8Z77-V is over the top; however, tweakers and gamers will find this to be a potent system for the price.

i REALTEK ALC892
8-CHANNEL HD
AUDIO
HDMI, DISPLAYPORT,
DVI AND VGA OUT
REALTEK 8111F, 1 X
GIGABIT LAN
CONTROLLER

\$199

**7
10**



i REALTEK 8111E
GIGABIT LAN
CONTROLLER
ASUS DIGI+ VRM
UTILITY AND ASUS
FAN XPERT+ FAN
CONTROL
64MBIT FLASH ROM,
UEFI AMI BIOS

\$155

**7
10**



ASUS P8Z77-V LE PLUS

A case of corner cutting

- @ www.asus.com.au
- ✓ Lots of PCIe/PCI options, eSATA out, excellent performance.
- ✗ No Intel NIC, no Wi-Fi.

We're not sure whether ASUS has too many product ideas on its hands or it's just trying to confuse the marketplace, but it has launched a whopping seven different variants on its P8Z77 motherboard. The P8Z77-V LE PLUS is just \$30 cheaper than the P8Z77-V, so what's been chopped from it?

All three PCIe full-length lanes are present and accounted for, and when combined with dual PCIe x1 slots and two PCI slots, provide a nice range of flexibility. The same Z77 chipset is in play, which delivers the usual four SATA 3Gbps and two SATA 6Gbps ports, but this time around an extra Marvell SATA 6Gbps connection delivers one eSATA port and one internal SATA 6Gbps port.

Gone is the Intel network controller, replaced by a Realtek 811F Gigabit Ethernet port. The Wi-Fi adapter has been ditched as well, which probably accounts for most of the price drop. A total of six USB 3.0 ports triples the number delivered by the Z77 chipset.

Interestingly, the power circuitry around the CPU has far less cooling on the LE PLUS variant, with only one small heatsink. It turns out that the cheaper board uses six-phase power instead of the eight-phase power on its bigger brother. As expected, performance was excellent, using the same tweaks as the P8Z77-V to give this board an edge.

While this remains a solid offering, we can't help but think the network connectivity and better power components available for just \$30 more on its bigger brother offer much better value. As a result, we recommend splurging just a little bit more for the P8Z77-V rather than buying this board, unless you really need that eSATA output.

ASUS P8Z77-V LX

The runt of the litter

- @ www.asus.com.au
- ✓ Healthy range of PCIe and PCI slots, strong performance.
- ✗ Lacking USB 3.0 and SATA 6Gbps outputs.

The last of the boards in our roundup found within ASUS's confusing (and extended) P8Z77 family, the P8Z77-V LX has been blessed with a significant price cut compared to the first two motherboards we've reviewed in this feature. Just how much has ASUS had to cut to lower the price by a third?

Full-length PCIe slots have been trimmed down to two on this unit, which is still plenty, even for dual-GPU gamers. Three PCI slots and dual PCIe x1 slots round out the excellent connectivity options. The DisplayPort output has also been removed, with just DVI, HDMI and VGA left to handle display duties. The onboard audio is also much more conservative, with an optical S/PDIF connector and three 3.5mm mini jacks spitting out the audio created by the cheaper Realtek ALC887 audio chip.

The USB 3.0 connectivity has been doubled from Intel's standard up to four ports, while SATA 6Gbps connectivity is stuck at the two ports offered by Intel's Z77 chipset by default. The 4 + 1 + 1 phase cooling isn't built for tweaking and as a result, it doesn't require any heatsinks for cooling. Despite the heavily trimmed-back feature set, the P8Z77-V LX retains ASUS's factory tweaks, leading to excellent overall performance.

All up, this is a well-rounded motherboard that doesn't really excel at anything in particular, although it will provide an affordable home for your new Ivy Bridge setup. The ASRock Z77-Extreme6 delivers more SATA 6Gbps ports, though, which could be a deciding factor for some users.



DVI-D, VGA AND HDMI
OUT
10 X USB 2.0 AND
4 X USB 3.0
DUALBIOS 2 X 65MBIT
FLASH AMI EFI BIOS

\$160



Gigabyte GA-Z77X-D3H

Powerful, but lacking features.

- @ www.gigabyte.com.au
- ✓ Healthy range of PCIe and PCI slots, solid performance.
- ✗ Average audio and Ethernet controllers, only two SATA 6Gbps ports.

At \$160, this motherboard falls towards the lower end of the mainstream range. If you've been reading all of the other reviews up until this point, you'll probably have a good idea of which boxes Gigabyte's GA-Z77X-D3H ticks off.

For a start, it uses the Z77 chipset to power three full-length PCIe slots, supporting SLI or CrossFire setups. Gigabyte has chosen to focus on PCIe x1 slots over PCI, with three of the former compared to one of the latter.

The sound system has been improved over the GA-Z77X-D3H's micro-ATX cousin, with optical S/PDIF out and five 3.5mm stereo mini jacks here, although it's powered by the same mediocre VIA 2021 chip. Once again, there's an Atheros network controller powering the Gigabit Ethernet port. It does the job ably, but isn't quite as desirable as an Intel controller.

Like other boards in this price range, Gigabyte hasn't increased the number of SATA 6Gbps ports, with just two SATA 6Gbps and four SATA 3Gbps; half that of the more affordable ASRock board. Thankfully, it's doubled the number of USB 3.0 ports to four. Performance was very good, scoring a few wins in our benchmarks while the rest stayed in the middle of the pack.

This motherboard is a very close competitor to both the ASRock H77-Pro4/MVP and ASUS P8Z77-V LX, and deciding which one to go for will come down to the components you're slotting into it. The ASRock has a slight edge in value, while the GA-Z77X-D3H offers better performance at stock settings.



HDMI, DVI-D
AND VGA
SUPPORTS FOUR
DDR3 DIMMS UP TO
2,800MHZ
1 X OPTICAL AND
COAXIAL S/PDIF OUT

\$159



MSI Z77A-G45

What does an extra \$20 buy you?

- @ au.msi.com
- ✓ Lots of PCIe x1 slots, excellent audio connectivity.
- ✗ Only three USB 3.0 and two SATA 6Gbps ports, mediocre performance.

At just \$20 more than MSI's Z77A-G43, it's interesting to see how different this Z77A-G45 is to its cheaper sibling. For starters, the coolers around the capacitors and motherboard chipset seem much more comprehensive, suggesting that it'll be able to handle extreme CPU frequencies better.

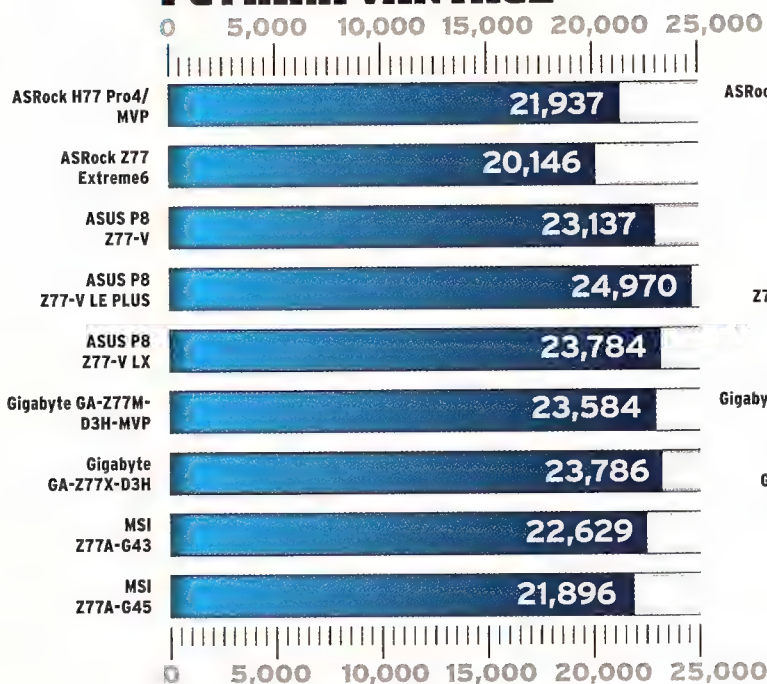
Legacy users have been left out in the cold with the removal of PCI slots. Instead, we're treated to three full-length PCIe slots, ready for your CrossFire setup. Strangely, MSI doesn't state that this product is compatible with Nvidia's SLI, yet we've found users online who have successfully run dual Nvidia graphics cards. Four PCIe x1 slots fill out the remainder of your component connection options, great for those who don't mind upgrading to the latest and greatest.

Once again we see the bare minimum of SATA ports, with dual SATA 6Gbps and quad SATA 3Gbps, while USB 3.0 ports have been increased to just three. As seen on the cheaper Z77A-G43, the same Realtek ALC892 handles audio decoding, but this time it's been armed with optical and coaxial S/PDIF out, alongside the six 3.5mm mini jacks.

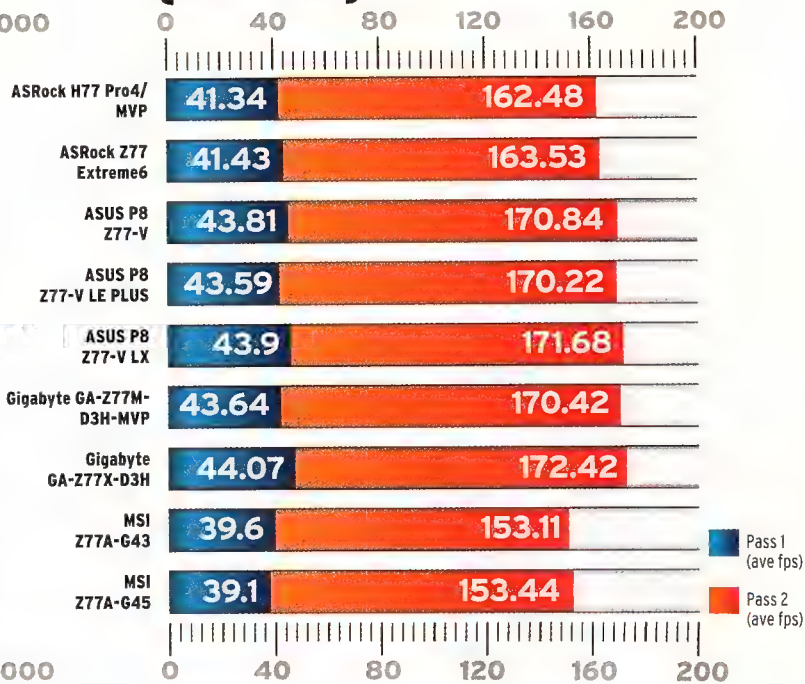
Other than those changes it's business as usual, so we weren't surprised to see this board suffering the same lacklustre performance of its brethren. This is more than likely caused by the conservative default BIOS settings, although this could easily be solved with a bit of experimentation.

The Z77A-G45 makes a solid basis for those with a suite of PCIe components, but the troubling performance numbers and lack of official SLI support could deter many.

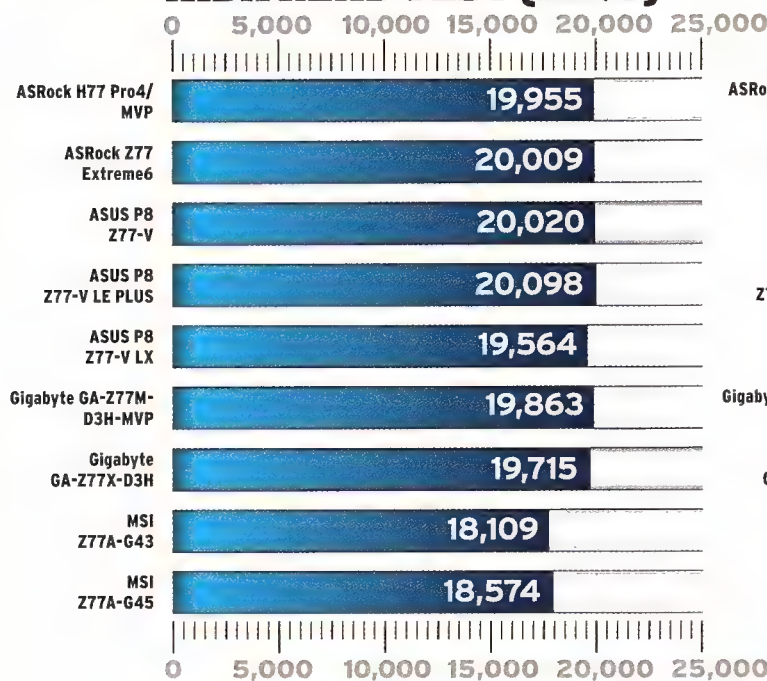
PC MARK VANTAGE



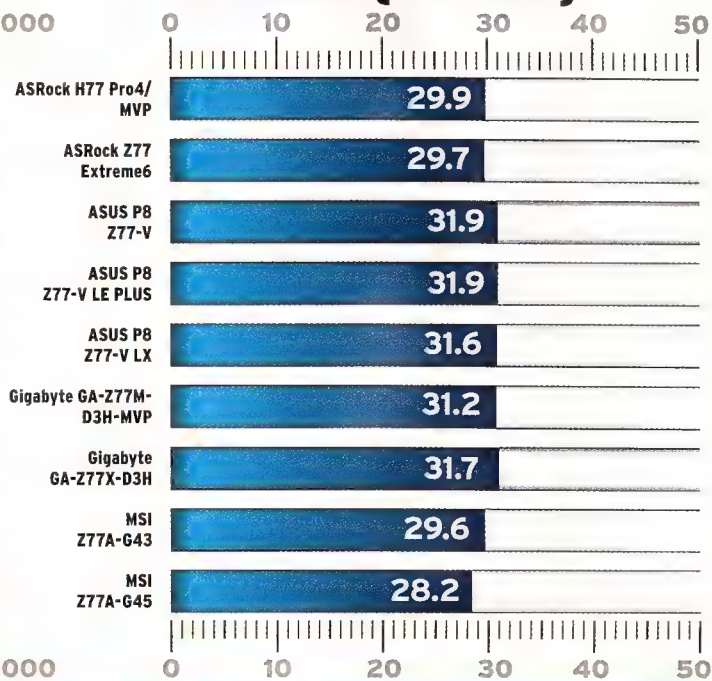
X264 HD BENCHMARK (AVG FPS)



AIDA READ TEST (MB/S)



SHOGUN 2 (AVG FPS)



BUDGET & MID-RANGE MOTHERBOARDS: HOW THEY COMPARE

Model	Price	PCMark Vantage	3DMark 11 (Performance mode)	x264 HD Benchmark - Pass 1 (avg fps)	x264 HD Benchmark - Pass 2 (avg fps)	Aida read test (MB/s)	Super PI 8M test (sec)	Shogun 2 (avg fps)
ASRock H77 Pro4/MVP	\$110	21,937	8218	162.48	41.34	19955	107.3	29.9
ASRock Z77 Extreme6	\$199	20,146	8208	163.53	41.43	19863	107.2	29.7
ASUS P8 Z77-V	\$230	23,137	8265	170.84	43.81	20009	105.8	31.9
ASUS P8 Z77-V LE PLUS	\$199	24,970	8268	170.22	43.59	20020	105.7	31.9
ASUS P8 Z77-V LX	\$155	23,784	8274	171.68	43.9	20098	105.9	31.6
Gigabyte GA-Z77M-D3H-MVP	\$110	23,584	8096	170.42	43.64	19564	106.5	31.2
Gigabyte GA-Z77X-D3H	\$160	23,786	8105	172.42	44.07	19715	105.7	31.7
MSI Z77A-G43	\$139	22,629	8121	153.11	39.6	18109	107.2	29.6
MSI Z77A-G45	\$159	21,896	8075	153.44	39.1	18574	118.7	28.2

All budget and mid-range boards tested with Core i7-3770K (Turbo on), 8GB DDR3-1800 memory, Corsair Force 3 128GB SSD, AMD Radeon HD 7970 graphics card, Windows 7 Ultimate (64-bit). With the exception of Super PI, higher is better for all benchmark results.

IVY BRIDGE ENTHUSIAST BOARDS

If only the best will do, a premium overclocking board is on the cards. Professional overclocker **James Trevaskis** puts six Ivy Bridge enthusiast motherboards through their paces.

APC readers regularly ask us why enthusiast boards are so expensive, sometimes priced well over \$500, and what the benefits are of making such a hefty investment.

Firstly, we'd like to debunk a myth that spending more money on your motherboard will result in higher overclocks. These days, most entry-level motherboards have good-quality power delivery and reasonable overclocking options, allowing them to achieve near-identical frequencies to even the most expensive boards on the market.

As a demonstration of this, we took an Intel Core i7-3770K CPU, locked the voltage at 1.4 and attempted to determine the highest frequency achievable in each board. Across the six boards we tested, we found only a 10MHz variance and even this could be put down to differences in ambient temperature and voltage regulation between the boards.

The real differences come in the additional features, many of which are targeted at extreme overclockers. The ASUS Republic of Gamers (ROG) range offers features including Liquid Nitrogen (LN2) mode, OC Key and the finetuning of PCIe voltages, all options that gamers or regular enthusiasts would never touch.

On the other hand, some of the features are extremely useful for general users, such as higher-quality onboard audio, enhanced Ethernet ports, increased bandwidth to PCIe lanes and additional SATA ports.

The truth to enthusiast boards is that you can often get what you want on a cheaper board. Sure, high-end boards look prettier, have cool names and impress people at LAN parties, but before you spend big, ask yourself if you really need even half of the features they offer.

ENTHUSIAST IVY BRIDGE BOARDS

i OC KEY
VGA HOTWIRE



ASUS Maximus V Extreme

Is there such a thing as
too many features?

@ www.asus.com.au

✓ The most feature-rich board we've ever seen.

✗ Excessively expensive.

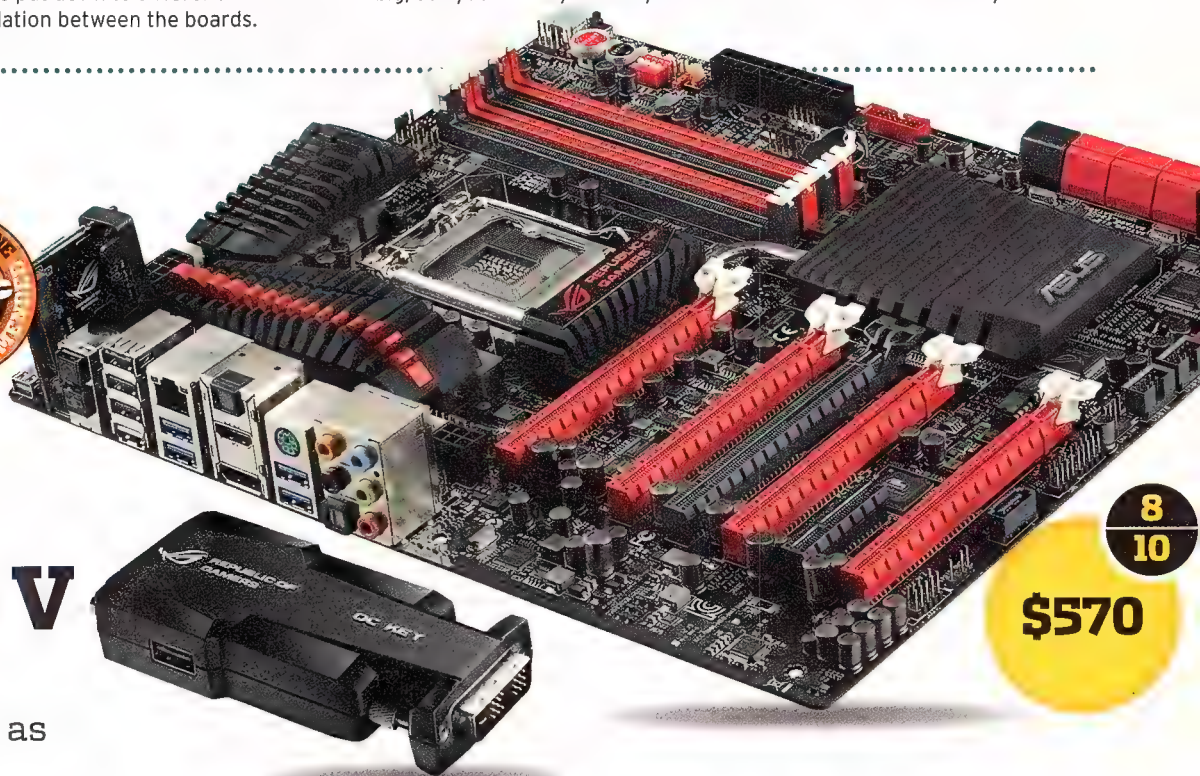
The Maximus V Extreme is a statement – a very clear attempt by ASUS to belittle the competition and stamp its authority on the enthusiast motherboard market. There's nothing normal about this Z77 board, beginning with the five full-length PCIe slots supporting up to four-way multigraphics configurations. Storage addicts should be satisfied with the eight SATA ports, a single Thunderbolt port and the inclusion of seven USB ports on the I/O shield. Backing up the impressive onboard storage is an add-on card including a dual-band Wi-Fi a/b/g/n adapter, Bluetooth 4.0 adapter and an optional mSATA slot.

This is where impressive ends and unbelievable starts. An onboard slow mode switch lowers the CPU multiplier instantly, allowing higher overclocks to be achieved by raising the system frequency after entering

Windows. ASUS has once again included OC Key, an interface that connects to your monitor and enables the onscreen adjustment of voltages and bus speeds without any software. Entering the slightly insane is both the VGA Hotwire and PCIe voltage adjustments that allow users to push their graphics cards to the extreme (and a long way beyond that) if they desire.

As you'd expect, the Maximus V Extreme is in the top range of our benchmark results, topping the leader board in the all-round system benchmark, PCMark Vantage.

This is an amazing motherboard and has every feature you could want and more, but we question whether anyone could justify the colossal price.



8
10
\$570

i OPTIONAL
WATER-COOLED
HEATSINK

9
10

\$420

i FIVE FULL-LENGTH
PCIe SLOTS



ASUS Maximus V Formula

The lovechild of performance and style.

@ www.asus.com.au

✓ Superb feature set.

✗ Expensive for an express chipset.

ASUS tortured enthusiasts with a three-month delay before finally introducing its full-sized Z77 ROG motherboards, but we're happy to report that the wait is finally over.

The Maximus V Formula is the little brother of the Maximus V Extreme, but still offers an abundance of features that most users could only dream of. Starting with four memory slots supporting up to 32GB of memory at 2,800MHz and three PCIe slots capable of three-way multcard configurations, this board means business.

There's no lack of storage capability either, with eight SATA ports on board and a further eight USB ports on the I/O panel. As we've come to expect from ROG boards, ASUS has included its SupremeFX audio technology, which features 7.1-channel audio and a built-in 300ohm headphone amplifier.

The use of an eight-phase CPU, two-phase memory and four-phase iGPU power delivery system helps ensure stability during those long gaming sessions – unless you overclock it too far, of course.

Supporting that impressive feature set is an out-of-this-world BIOS, with memory tuning options that leave even the most seasoned expert feeling overwhelmed. Throughout our performance testing, the Formula was at the forefront of the results. Excelling in both the *Shogun 2* and 3DMark 11 benchmarks, this motherboard has definitely been tuned with gamers in mind.

The ASUS Maximus V Formula has an amazing feature set as well as an abundance of BIOS options. It's the perfect motherboard to use as the basis for any ultra-high-end gaming system.

EVGA Z77 FTW

Got PCIe slots?

@ www.evga.com

✓ Four-way SLI support.

✗ Single-card gaming performance is a little low.

EVGA is a name that most enthusiasts will be familiar with for its innovative Nvidia graphics cards. The most recent incarnation of its gaming-targeted 'For the Win' motherboard series is the Z77 FTW.

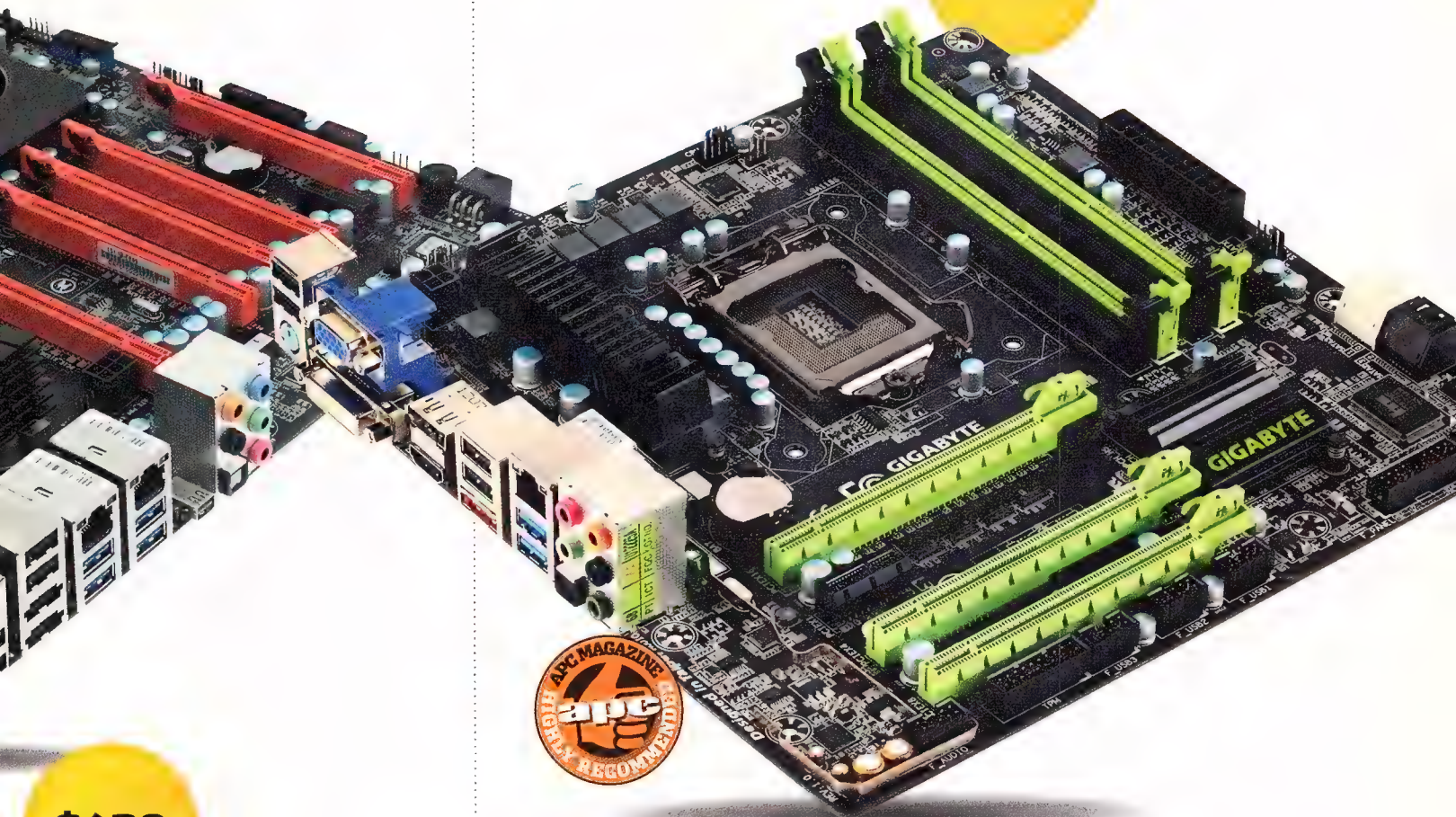
Clad in the series' legendary black and red colour scheme, the FTW immediately stands out from endless other high-end boards on the market. Backing up the superb looks are five full-length PCIe lanes, supporting up to four-way graphics configurations, extending to Nvidia cards to match EVGA's VGA lineup. Exuberant storage needs are also catered for by eight SATA ports, with an additional two eSATA ports and 10 USB ports available from the rear I/O panel.

This board is also an overclocker's dream, with plentiful power connectors, high-quality power delivery and the proprietary EVGA

 MICRO-ATX FORM FACTOR

8
10

\$200



\$420

7
10

Gigabyte G1.Sniper M3

Powerful performance in a pint-sized package.

 www.gigabyte.com.au

 Great benchmark performance.

 Only four SATA ports.

E-LEET software for directly tuning the BIOS from within Windows.

For a board targeted towards SLI configurations, the performance is extremely strong. During CPU, memory and disk benchmarks the FTW excels, only dropping off slightly during the 3DMark11 benchmark. As soon as you plug in additional graphics cards, the 3D performance is much stronger, a by-product of the onboard PLX chip. This PLX chip is capable of delivering higher bandwidth to the PCIe slots, resulting in increased frame rates across most games.

EVGA has delivered a pure enthusiast board here, with good performance and great features – basically everything you need to build a screaming fast gaming rig. The only real drawback is the price. At over \$400, it's going to bust most budgets.

Following in the footsteps of its bigger brother, the G1.Sniper M3 is designed, built and tuned with gamers in mind.

With its black PCB and lime trimmings there's no doubt the M3 is a looker, but it's not lacking on features either. On this micro-ATX board you'll find three full-length PCIe slots, but due to the M3's smaller size, these are only capable of supporting two-way graphics configurations.

The rear I/O shield features all the common display ports as well as Gigabit Ethernet and six USB ports, with a further eight USB ports accessible via motherboard headers.

Gigabyte has also included its premium audio solution based on the Creative CA0132 chip, capable of delivering 5.1-channel audio. There are only four SATA ports on board, however, which is one notable drawback of

the micro-ATX size.

Perhaps the most impressive trick the M3 has up its sleeve is performance. Across all the benchmarks we used, it shone brightly as one of the top performers, even when directly compared to boards that cost more than twice the price. Marrying into the strong benchmark results is a BIOS with solid overclocking options, allowing us to push our CPU to the same frequencies we reached on the more upmarket G1.Sniper 3.

Gigabyte has done a great job of balancing the price, essential gaming features along with the micro-ATX form factor with this little number. The result is a board that's capable of overclocking and gaming with the performance you would expect from enthusiast motherboards, and all without breaking the bank.

i ULTRA DURABLE 4
POWER DELIVERY

9
10

\$270

i THUNDERBOLT PORT

8
10

\$310



Gigabyte GA-Z77X-UD5H

Killer performance for a bargain price.

@ www.gigabyte.com.au ✓ Superb feature set. ✗ Doesn't have the bling factor.

The Gigabyte UD range has been an enthusiast favourite for years and with the release of the Z77 comes the GA-Z77X-UD5H.

While it isn't going to win any beauty contests, it has the affordable performance market cornered. Featuring three PCIe slots capable of three-way graphics configurations and eight SATA ports, it has similar specifications to the most expensive boards on the market. There's also dual Gigabit Ethernet on the I/O shield, as well as both HDMI and DisplayPort outputs for the onchip graphics. Gigabyte has also squeezed power and reset buttons on board, handy for tuning the system or troubleshooting any problems.

An all-new digital power delivery system named Ultra Durable 4 has been implemented across Gigabyte's entire Z77 range. This features ferrite core chokes, Japanese solid capacitors and low RDS MOSTFETs. This may sound complicated, but it simply translates to lower temperatures and higher stability under all conditions.

During our performance testing we found the GA-Z77X-UD5H to be the most consistent performer of all the boards we tested. This peaked with best-in-class results during the Super Pi benchmark, indicating strong overall system performance.

If you want a board with all the bells and whistles, this probably isn't the right one for you. The GA-Z77X-UD5H is a perfect combination of price and features, and a great platform for anyone from an entry-level gamer to an extreme overclocker.



MSI Z77A-GD80

A classy all-rounder.

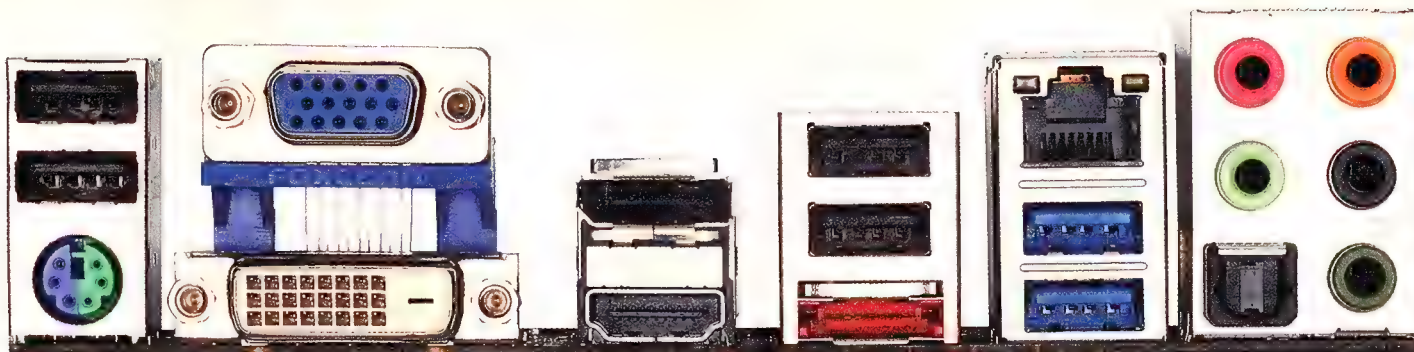
@ au.msi.com ✓ Automated overclocking via OC Guru. ✗ Disk access speed is a little slow.

MSI has been struggling to make an impact in an enthusiast market filled with already established names, but the latest iteration of its GD series threatens to change all of that.

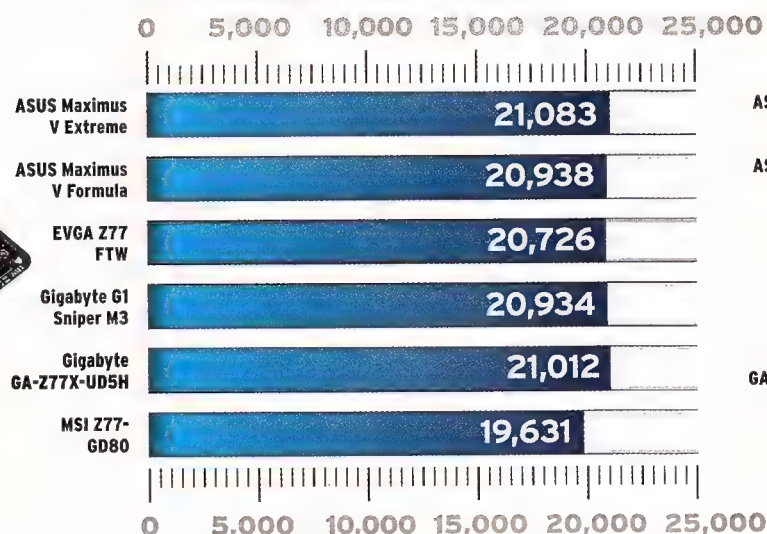
The Z77A-GD80 is a great-looking board. MSI has kept the military-inspired theme, but scaled back from the bullet-filled heatsinks to a more elegant, understated design. It has three full-length PCIe slots capable of running both three-way SLI and CrossFire configurations. The rear I/O panel is filled with six USB slots, DisplayPort, HDMI and, of course, a Thunderbolt port. In fact the Z77A-GD80 is almost identical to its little brother the Z77A-GD65, except for the inclusion of that Thunderbolt port. Also supported is up to 32GB of memory running at 2,800MHz – if you have the right memory kit, that is. Like most upper-echelon Z77 boards, this one features eight SATA ports in total, four of which are SATA 6Gbps.

In the past, the performance of MSI boards has been a little off par, but this certainly isn't the case here. In fact, throughout our memory-focused benchmarks the Z77A-GD80 was consistently in front of the competition. The only blemish on a near-flawless performance evaluation was a slight dip in the PCMark Vantage benchmark, indicating the SATA speeds were a little off the mark.

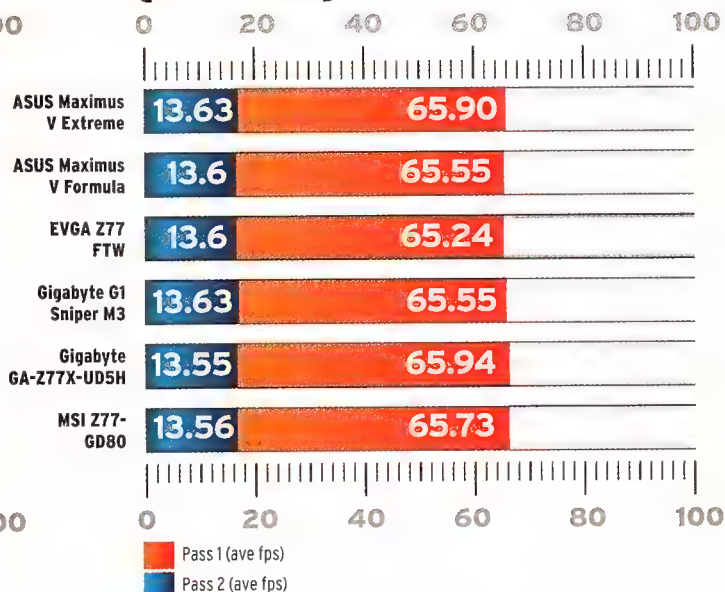
The Z77A-GD80 is a superb board with strong all-round credentials. From the quality of the components used to the beginner-friendly BIOS, this one exudes class. **BTG**



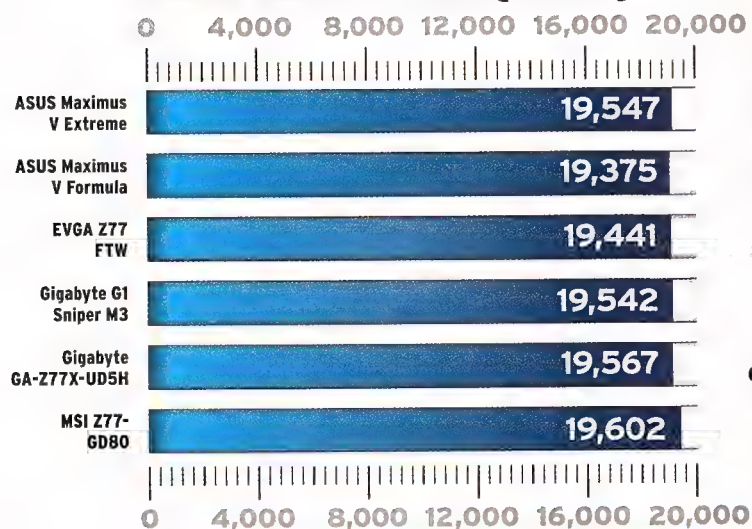
PC MARK VANTAGE



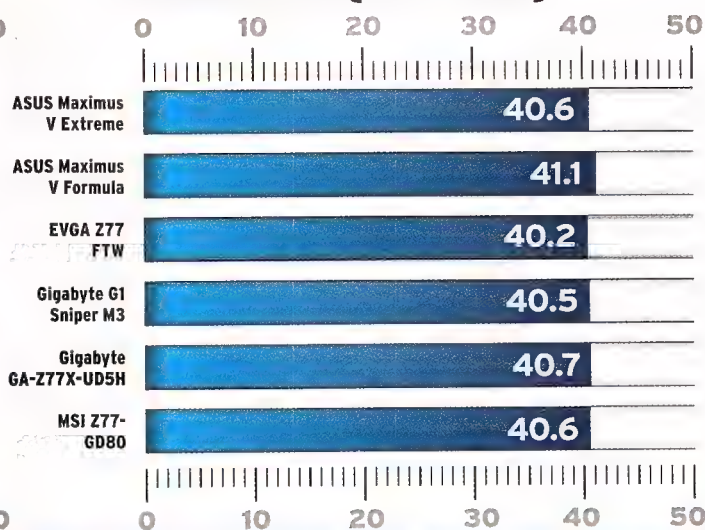
X264 HD BENCHMARK (AVG FPS)



AIDA READ TEST (MB/S)



SHOGUN 2 (AVG FPS)



ENTHUSIAST MOTHERBOARDS: HOW THEY COMPARE

Model	Price	PCMark Vantage	3DMark 11 (Performance mode)	x264 HD Benchmark: Pass 1 (avg fps)	x264 HD Benchmark: Pass 2 (avg fps)	Aida read test (MB/s)	Super Pi 8M test (sec)	Shogun 2 (avg fps)
ASUS Maximus V Extreme	\$570	21,083	8,300	65.9	13.63	19,547	116.173	40.644
ASUS Maximus V Formula	\$420	20,938	8,295	65.55	13.6	19,375	116.361	41.09
EVGA Z77 FTW	\$420	20,726	8,002	65.24	13.6	19,441	116.594	40.206
Gigabyte G1 Sniper M3	\$200	20,934	8,294	65.55	13.63	19,542	116.111	40.522
Gigabyte GA-Z77X-UD5H	\$270	21,012	8,271	65.94	13.55	19,567	116.096	40.696
MSI Z77-GD80	\$310	19,631	8,291	65.73	13.56	19,602	116.625	40.642

All enthusiast boards tested with Core i7-3770K (Turbo off and clock speed locked to 3,500MHz), 8GB DDR3-1800 memory, Corsair Force 3 128GB SSD, AMD Radeon HD 7970 graphics card, Windows 7 Ultimate (64-bit). With the exception of Super Pi, higher is better for all benchmark results.

Google Play

Cogs

A multi-faceted puzzle game.

 \$3.07 | Lazy 8 Studios | tinyurl.com/ctq4auz

With the number of puzzle games available on mobile devices, *Cogs* stands out. Why? It ticks all my boxes: the sounds and graphics are attractive, the levels are challenging and the gameplay shifts enough to keep me interested.

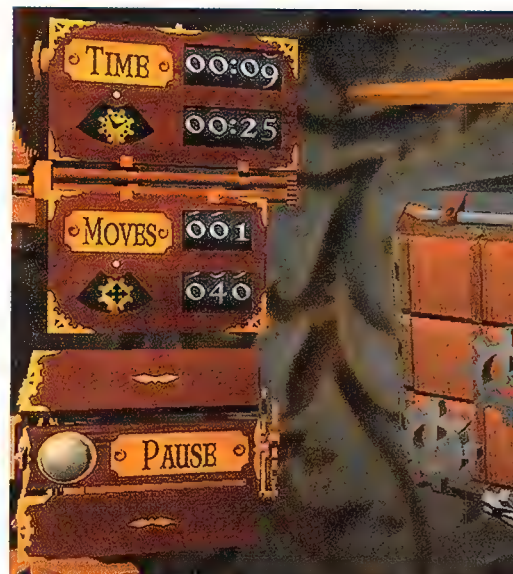
It's based on the ageless tile-sliding puzzle game, but what sets it apart is that it's set on a 3D board game. You're not just tasked with solving one board – you also need to (with a two-finger swipe) spin the prism on which the board lies to solve boards on the other sides.

Further to this, the goal of the challenge changes from level to level. On some levels,

you need to line up cogs; on others you need to join up pipes; and sometimes both.

There are two game modes available: Inventor Mode, where you have unlimited moves and unlimited time (although there are better awards for more efficient use of those resources); and Challenge Mode – really, two sub-modes – where you're given either limited time or limited moves to complete the challenges.

There are 50 puzzles, with each being reused for the three modes, providing what the developers claim will be 10 hours of gameplay.



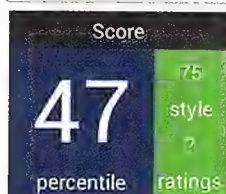
RateBeer for Android

 Free | 2312 development | tinyurl.com/cjotijk

RateBeer is the mobile app for the popular beer rating web site www.ratebeer.com. Scan a barcode of a beer to see what users think about it. There appears to be enough Australian users that many local beers are covered. If you have a RateBeer account, you can leave your own ratings and send/receive messages to/from other beer lovers. If not, you can still view pubs/breweries, events, learn about the many beer styles, or view the best beers by country.

Coopers Sparkling Ale

 by Coopers Brewery



Screen Filter

 Free | haxor industry | tinyurl.com/7og3rm3

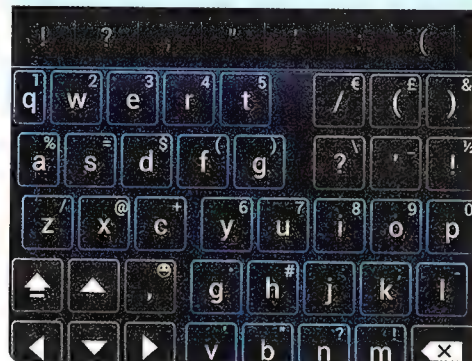
Sometimes, the dimmest setting on your phone's screen just isn't dim enough. I've often been lying in bed, lights out, when an idea comes to me that's worthy of noting down. Upon unlocking my phone, I'm suddenly unable to take note of my idea, as my eyeballs have caught fire and exploded from my head. Rather than spend countless hours/dollars on eye replacement surgery, I've since set Screen Filter's additional Locale/Tasker plug-in to trigger whenever I plug the charger in at night.



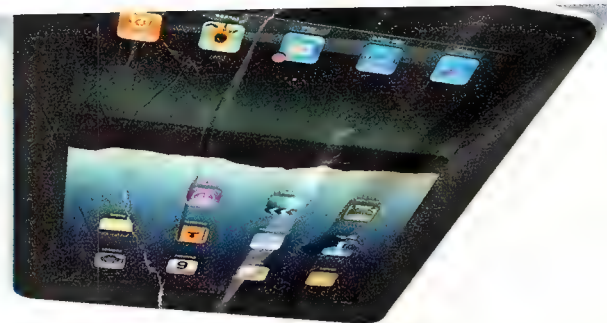
Thumb Keyboard (Phone/Tablet)

 \$2.34 | Beansoft | tinyurl.com/75j2l53

A nifty keyboard that splits the keyboard up into two sections – one positioned above the other – so that there's plenty of room for each of your thumbs without colliding. If this doesn't really appeal to you, you can choose from two other phone layouts. Better yet, if you're running this on a tablet, you can even choose from several layouts designed for tablets of different sizes. It also includes 29 skins, customisable backgrounds and more options than you can shake a phablet at.



App Store



Launch Center Pro

\$5.49 | App Cubby | tinyurl.com/d313550

Stick this app in your dock and get touch and slide access to 12 shortcuts, such as text/call/email a specific contact, launch Instagram's camera, open a specific web page, turn on a flashlight, search Twitter, find a nearby café (via Yelp) and more. To make identifying your shortcuts easier, you can select custom colours and icons. Shortcuts can also be used as groups, which will open up an additional 11 actions when selected. A full list of compatible shortcuts is available at appcubby.com/apps.



Unstoppable Fist

\$0.99 | Ragtag Studio LLC | tinyurl.com/bqpbv41

Unstoppable Fist is a sort of rhythm game, rendered in 16-bit, where you play an alien demigod with brutish good looks and a pest problem. You must tap the screen in one of six zones, each corresponding to a high, medium or low attack on the left or right of the screen. You need to tap these at the right moment to punch/kick the offending chicken/fish/zombie head. Cool graphics, with a kickin' soundtrack available for free from unstoppablefist.bandcamp.com.



Zombies, Run!

\$8.49 | Six to Start | tinyurl.com/ccetj74

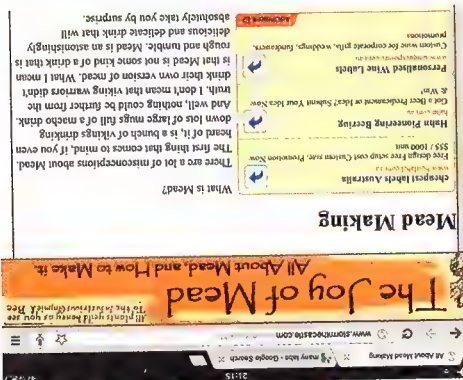
A combo running app and zombie apocalypse survival game, *Zombies, Run!* may just provide you with the motivation you need to get out of the house and shake off the winter 'blanket' that you developed these last few months. As a 'runner' in the Abel township – one of the few remaining oases of humanity left – you're one of the few sent to find supplies, news or to scare away invading hordes. The storyline, while interesting, isn't the novel part of this game. What really sets it apart is the execution: you play the game by running. Actually running. You plug in your headphones, listen to the mission briefing and then get running. Commands will occasionally bark from the radio, letting you know when you've collected various items or warning you of an incoming zombie mob (meaning you have to run faster), but for most of it, you get to listen to your own playlist. When you return back to Abel, the items you collected on your run can be used to upgrade the township and unlock additional missions. Gamifying exercise is a great way to make running a little more addictive and for that alone, I have to give these guys props.



Chrome

Free | Google Inc. | tinyurl.com/cxxv33n

Google Chrome on iOS is every bit as wonderful as Chrome on the desktop. The Omnibox (the best thing on the internet since lolcats) is so intuitive that you'll wonder why it's really the only browser that offers it. Better yet, sign into your Google account to access all your desktop bookmarks, passwords, history and even the tabs currently open on your desktop. It also includes Incognito mode for all those times... well, you know.



Windows Store

best software



photo2cloud

\$2.49 | Neologics S.N.C. | tinyurl.com/d9azddl

photo2cloud allows you to back up your photos, in full resolution, to SkyDrive, Picasa, Flickr, Dropbox and/or Box. The power in the app lies in its ability to back up different albums to different accounts, or single albums to multiple accounts. Unfortunately, apparently due to limitations in the WP7 OS, automatic backup isn't supported and background uploading can only support a queue of five or less photos (in-app uploading doesn't have such a limitation). In place of an automatic or scheduled backup, you can set a reminder to let you know that it's time to run a backup operation.

In truth, I've never been a fan of instant uploads, as I usually prefer to take lots of photos of an event/object and then delete the crappy ones. Instant upload would mean that a fair bit of my quota/battery life would be wasted uploading photos I have no intention of keeping. So I'm actually happy to just back them up at the end of a given day, rather than instantly, although it would be nice to be able to get it to schedule these automatically. Hopefully this will come in time.

A trial version is available that limits uploads to five photos per day to give you an idea of what to expect.

Chrync brings your Chrome bookmarks to your WP7 handset using a simple Google Account sign-in. You can sync bookmarks, passwords, history and/or open tabs. The app doesn't overwrite or integrate with your existing IE bookmarks, though. You open the app and then click on a bookmark to launch IE. You can view and click on your history, or any open tabs on your desktop. It lets you pin bookmarks and bookmark folders, as well as share them with others.

Chrync

\$0.99 | Atadore SARL | tinyurl.com/d9ycmhn

Place a Live Tile on your home screen that counts down to a specific day. While I'd prefer if you could also specify a time of day, it's handy for noting how far away your next holiday is, when your milk expires, or even when your cult leader predicts the apocalypse will arrive and the Ascension requires you to open the app every 14 days, lest the tiles stop counting down, so make sure you do this or risk eternal damnation.

CountdownTiles

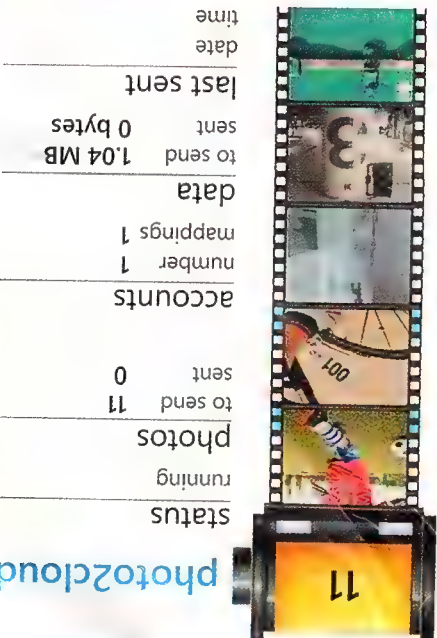
\$0.99 | Giovanni Brienza | tinyurl.com/d522nfn

If you're trying to shed some of the weight you gained over winter, perhaps you've started exercising. If so, it can be particularly useful to know your heart rate, as it can be a good yardstick for measuring your improvement in fitness. By placing your finger on the camera lens of your handset, easyHeartRate can view the changes in colour caused by the blood coursing through your veins and give you a fairly accurate idea of your heart rate.

easyHeartRate

\$0.99 | wsoftvn | tinyurl.com/bwhrgjt

status	running
photos	to send 11
sent	0
accounts	number 1
mappings	1
data	to send 1.04 MB
sent	0 bytes
last sent	date
time	



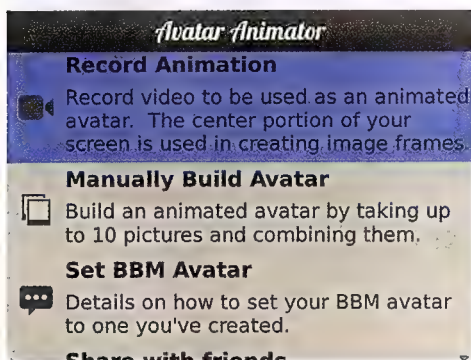


App World

Avatar Animator for BBM

i US\$0.99 | mblware Inc.
| tinyurl.com/cdddyqj

If you're looking to bling up your BBM avatar, why not consider animating it? The Avatar Animator for BBM app makes the process a cinch, by allowing you to either shoot a video or provide up to 10 images to turn into your new digital representation of self. This is, in effect, an animated GIF creator. However, don't expect the GIFs to be of any use elsewhere – they're very small and really only suitable for a BBM avatar.



BeWeather HD for PlayBook

i US\$4.99 | Bellshare GmbH
| tinyurl.com/bovtgzx

Whether you're worried that the weather looks woeful or wondering what to wear on Wednesday, you want reliable weather warnings. Alliteration aside, it also helps if they're attractive. BeWeather HD does just this, with animated weather-contextual backgrounds. Of course, functionality is also paramount and it provides all the info you need on one screen. My only gripe is that it doesn't work with a GPS, but manually specifying your location is no deal-breaker.



Snipper

i Free | Serramedia BV | tinyurl.com/c4ghdnc

With Snipper, you can easily share the videos you're snapping to prescribed, specific groups of friends, or like YouTube, to a public or private channel. Of course, it's the ability to share them to specific groups that makes it interesting (otherwise you'd just use YouTube, right?), as it means you can film and distribute that all-important conference speaker to your colleagues and clients, and then also the networking drinks shenanigans for your friends and more interesting colleagues – and never the twain shall collide.



Pocket Trainer

A personal trainer in your pocket.

i \$12.99 | Core Interaction Inc. | tinyurl.com/d8enxdq

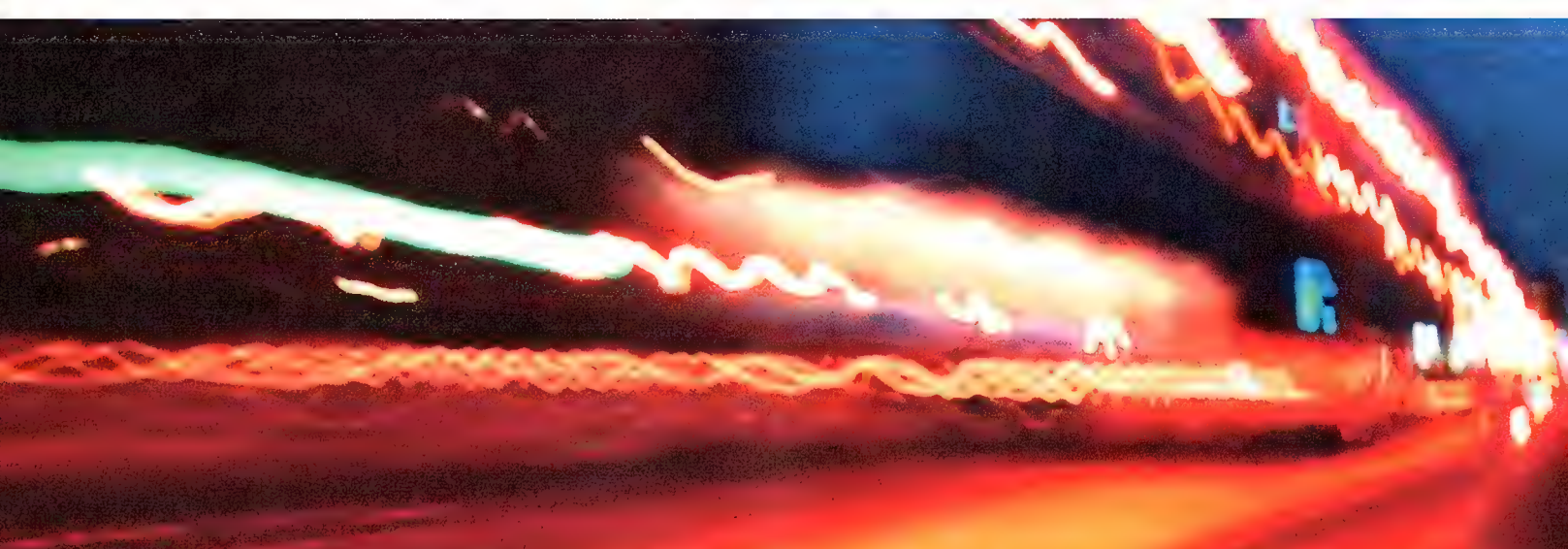
Losing weight can be as easy as eating smaller portions of healthier meals, but to get fit, you need to exercise. For many, this can be an intimidating task. Pocket Trainer helps you get it done, as it tailors exercises based on how much time you have available.

More than just basing it around available time, however, it also bases the routine (selected from over 300 different exercises) on your weight, height, available equipment and your level of experience (in my case, beginner). The routine will become more rigorous as you become better, making sure that you're getting the most out of your allocated exercise time.

Workout Preview			
Beginner Phase 1	Week: 1/4	Day: 2/2	
Exercise	Reps	Set	
Breathing Squat	15	3	
Two Arm Hip Swing	15	3	
Dips Plus	20	3	
Door Pull-up	8	3	
Step-up	15	3	
Horse Stance Vertical	3	3	
Squat Cross lift	10	3	
Supine TVA Activation	5	3	

As a beginner, it was great to be able to watch video demonstrations of the exercises – much cheaper than forking out for a personal trainer or gym membership – although if you do have access to a gym, you can easily select

between home and gym exercising from the workout selection menu. At \$12.99, it's at the higher end of app pricing, but it's cheaper than a personal trainer and really, when your health is concerned, it's not that much to pay. **ATC**



THE HISTORY OF STREAMING MEDIA

What happens when you watch that movie over the internet?

Julian Bucknall explains.

The London Olympics highlighted the quality of streaming media today. For the first time, we saw sports events streamed at HD resolution via the web, something unthinkable just a few years ago, when even a tiny clip on YouTube was a halting, buffering affair. Although I'm sure, like me, you have a vague appreciation of what streaming is – after all, watching movies and TV shows over the internet is all part and parcel of the 2012 always-on society – the truth is even more peculiar than you might expect. In a way, it's amazing it works at all.

The earliest reference to what we might recognise as 'streaming media' was a patent awarded to George O Squier in 1922 for the efficient transmission of information by signals over wires. At the time, broadcast radio was just starting up and required expensive and somewhat temperamental equipment to transmit and receive. Squier recognised the need to simplify broadcasting, and created a company called Wired Radio, which used this invention to pipe background music to shops and businesses. Later he decided to ape the Kodak brand name by renaming the company Muzak.

This was the first successful attempt to multicast media (that is, transmit one signal over a cable to several receivers simultaneously).

DIGITAL STREAMING

That was pretty much it for broadcast (radio and TV) and multicast (Muzak) until the age of computers, especially personal computers. It wasn't until the late 1980s or early 1990s that computers had the hardware and software capable of playing audio and displaying video.

The main issues that remained were a CPU powerful enough to render video, and a data bus wide enough to transmit video data to the video adapter and monitor. It also required network bandwidth (this was the age where the best access to networks was through a 28.8Kbps modem).

In fact, for a while the only option available was to download the media as a file from some remote server and play it once the file was fully downloaded. Consider the problem: a PC usually had an XGA monitor with a resolution of 640 x 480 pixels at 16 bits per pixel. Video, though, was 320 x 240 pixels. At a video refresh rate of 24fps, the data bus on the PC

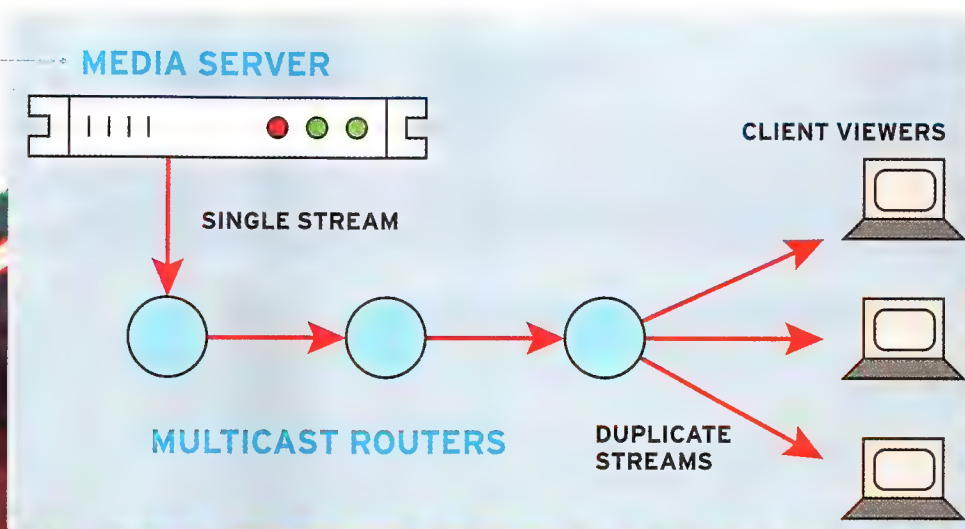
had to process 320 x 240 x 2 (bytes per pixel) x 24 bytes per second, which works out at about 3.5MB per second.

Several things had to come together before streaming media could happen. First of all, the video itself had to be compressed to reduce the footprint of the media file on disk. At 3.5MB/s, a 1-minute video would take up 200MB on the hard drive – an amount of space that frankly wasn't readily available on most PCs at the time. The CPU had to be able to decompress the video data in real time and render frames at the correct frame rate. The data bus of the PC had to be able to handle transferring that amount of data to the video subsystem, and the latter had to be able to refresh the monitor at the correct frame rate. By the mid-1990s, the requisite stars had aligned.

MULTICASTING

In 1992, an experimental network was born: the Mbone. This was a virtual network superimposed on the normal internet whose main purpose was multicasting. Multicast in this scenario is a technology that allows data to be streamed efficiently from one server to several receivers simultaneously. An example

Figure 1. A multicast network distributes media with little bandwidth loss.



HTML5

Up until two or three years ago, Adobe Flash ruled streaming video. Then came the iPad and its lack of support for Flash. Instead, Apple championed HTML5 for playing back video on its tablet.

From that point on, HTML5 video was the new standard and the use of Flash began to decline. In order to support HTML5 video, a user must have an HTML5-compatible browser (all mobile devices have such a browser, and nowadays so do laptops and desktops), and that browser must have installed the codec used to compress the video. At the start, the latter requirement was problematic: Chrome and Firefox chose to

implement the WebM codec, whereas Safari and IE9 chose H.264 instead. This meant some issues for video providers since they had to provide two differently encoded videos; in reality, though, H.264 is almost certainly going to win those particular wars, as most mobile devices use it.

Despite its appeal, HTML5 video still doesn't support much-needed commercial technologies, such as adaptive streaming for live content, content protection for premium channels or playback locking for advertising. Nevertheless, it's certain to become the streaming video viewer of the future.

of a situation that benefits from multicast is an internet radio station. Such a station will present a stream of music data that users can subscribe to, but all users will hear the same stream. From the internet radio station's viewpoint, all it needs is a single low-bandwidth connection to the multicast backbone, and the rest of the transmission and eventual duplication of the data stream is done by the nodes on the internet. Increasing the number of listeners wouldn't impact the internet radio station too much at all.

The corresponding technology is known as unicast, which is what we use when we watch a YouTube video or a movie online: one server sending a data stream over the internet to a single receiver, namely your PC. To continue our example, an internet radio station wouldn't benefit from unicast since it would have to transmit a data stream to every listener. Increasing the number of listeners would require increasing the station's server and network capacities.

The issues with multicasting are several. First of all, it requires special routers as nodes on the network to pass on the single data stream. It has to build up a tree of these special

routers for it (or the network) to program those routers so that only a single data stream is passed between them. Obviously, only multicast routers can be linked in this tree. This is generally known as tunnelling – the special routers tunnel the multicast data stream between them over the normal internet. Then, each receiver must be able to identify its nearest multicast router so that it can receive a unicast of the data stream from that router. The router acts as a duplicator of data (see **figure 1**).

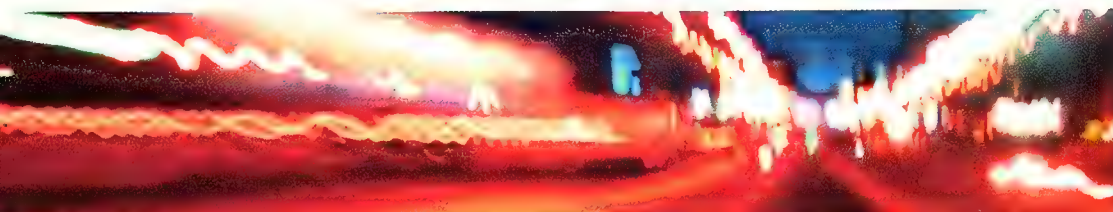
The other main issue was touched on in our example of an internet radio station: multicast poses problems with regard to paying for it, especially with regard to ISPs' costs. With a multicast internet radio station, the station's local ISP only passes through a single data stream, regardless of how many listeners there are. The data duplication is done by the routers that are geographically far from the transmitter.

Although Mbone was successful as a research project – it was even used to multicast a Rolling Stones concert at the Cotton Bowl in Dallas – it never really caught on. These days it's mostly used for videoconferencing.

CODECS

At its most basic, a codec is a compression algorithm for media. The most famous codecs for audio are MP3 and AAC, and video uses H.264 and the various MPEG codecs. All the video codecs used are lossy compression algorithms. Some are very simple and don't compress too well; in essence, each frame is compressed as an individual JPEG image.

The main ones used in streaming use interframe compression. Here the codec compresses static parts of the video once (a keyframe), and in subsequent frames only compresses the changing parts of the scene (delta frames – see **figure 2**). This is much more efficient, but it does lead to problems when seeking within a video (see the 'Seekpoints & keyframes' box on page 82 for more information). Newer codecs such as H.264 use different types of delta frames to achieve even better compression. Most codecs are patented and licensed for use.



SEEKPOINTS & KEYFRAMES

Pseudo-streaming allows the user to pick a point from which to continue viewing the video. Since the video is usually highly compressed, there's a problem: the point chosen to seek to is likely part of a compressed chunk of data. The user would see garbage and not the actual video.

For this feature to work, the video must be encoded with a list of seekpoints. These define a position in the video (either as a byte reference or as an offset time), which define keyframes of the video. A keyframe is a point at which the compression algorithm starts afresh to encode the frames of the video, and thus references a point at which the viewer can load a complete frame and then the subsequent delta frames. If a user selects a point, say on the video playback

progress bar, the viewer will choose the seekpoint nearest to that selection and the playback will continue from that particular keyframe.

The more seekpoints there are, the finer the granularity of selecting a position to resume video playback and the less likely it is that the user will notice the video starts at a slightly different position than that selected. Of course, the more seekpoints there are, the less efficient the compression ratios are and the more data needs to be sent.

The video encodes these seekpoints as metadata at the start of the video file. The viewer will download and store the list before playback commences, thus allowing users to select a playback point at any time.

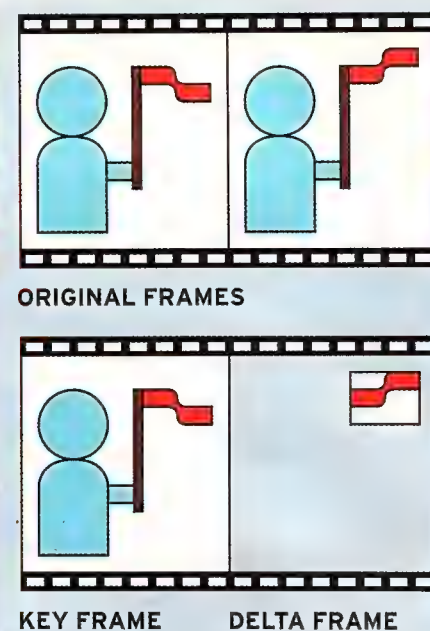


Figure 2. Interframe compression showing keyframe and delta frame.

STREAMING

By the late '90s, streaming video had started to become the norm. Unlike in previous years, where the video had to be downloaded in its entirety before viewing, streaming is characterised by playing the video data as it's received. First, this requires a special compressed video format to facilitate play while downloading. The viewer has to buffer enough data to play should there be some network contention; a few seconds' worth, say. The protocol between the viewer and remote media server must allow for renegotiating the resolution of the media should the latency or bandwidth of the network change. If the network latency increases and/or the bandwidth decreases, a lower resolution may be more acceptable than introducing stuttering to the user's playback experience.

Before the turn of the millennium, there were several competing streaming video viewers available. The first was RealPlayer, which was launched in 1997 and had been demonstrated from 1995. Microsoft implemented streaming video playback in Windows Media Player in 1999, as did Apple with QuickTime. These streaming viewers required web sites to install the corresponding media servers in order to provide properly formatted streaming video for playback, so for a few years, users had to contend with the possibility of needing to install three incompatible viewers in order to view content.

This state of affairs continued until about 1992 when Macromedia Flash became prevalent. In essence, alongside animation, programmability, games and so on, it provided a multi-platform, multiple-browser streaming

viewer, free of charge, and free of the vendor lock-in that characterised its predecessors. Flash became so successful that it was available on the vast majority of PCs, and formed the basis of streaming sites, such as YouTube, Vimeo and so on (Netflix uses Microsoft's Silverlight streaming viewer).

Nowadays, there's been a move away from Flash as a streaming viewer. It requires some fairly intensive CPU resources and therefore compromises the battery life of mobile devices such as smartphones and tablets.

PSEUDO-STREAMING

Nowadays, video streaming tends to split into two camps: there's what might be called pseudo-streaming and there's streaming proper. Pseudo-streaming is characterised by downloading an actual file and playing that file as it's being downloaded. YouTube videos tend to be of this variety – you download a video file (and save it temporarily) and play it back during the download. Since the complete file is downloaded, replaying a YouTube video tends to be very quick, as there's no more data to download. However, the file is managed by the viewer and will be deleted once the user moves away to another video.

The media server is different for pseudo-streaming as well. In essence, it operates as a big peer-to-peer file server: it stores a set of files and will send one as fast as possible to a client requesting it. Nevertheless, it allows for seeking to a particular point in the video, without having to download all the data in between. Pseudo-streaming also uses HTTP as a delivery protocol, so it's available on local corporate networks that may block other ports.

Real streaming, on the other hand, is characterised by a data buffering viewer (all data is kept in memory), with no file being saved on disk. Real streaming also allows for automatic resolution changes (say from 720p to 480p or vice versa) to contend with real-time changes to the network throughput or latency, whereas pseudo-streaming has no such feature. Of course, with some YouTube videos you can elect to view the video in a higher or lower resolution, in which case the video resumes at the changed resolution. For this to work, though, the video must have been uploaded at those different resolutions in the first place – the server, in effect, has to store multiple resolution versions of the video.

Media servers that provide real streaming use a different protocol and port to provide video and audio streams. A common protocol used is RTMP (Real-Time Message Protocol, used by Flash streaming), where the port used is 1935 (HTTP's is 80). There are other variants, including one that tunnels streams through HTTP. There are also other protocols in use such as RTSP (Real-Time Streaming Protocol), which uses RTP (Real-time Transport Protocol) and RTCP (Real-Time Control Protocol). These protocols break up the streams (generally there are more than one, such as a video and an audio channel) into very small packets and then transmit them to the client viewer.

All in all, streaming video has come a long way. Nowadays it's a big part of modern online society, from cat videos all the way to live HD broadcasts of the Olympics. In the audio space it's all Spotify and Pandora, the new individualised internet radio stations. In the future? All that and more. [B&B](#)

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IS WINDOWS 8 FOR YOU?

With Microsoft officially announcing the release date for Windows 8 as October, we're finally on the home run towards the next iteration of Redmond's 27-year-old operating system. But is it worth your time and money? [Ashton Mills](#) asks and answers the hard question.

Windows 8 is, without doubt, one of the more significant paradigm shifts for both Windows and Microsoft in the past two decades – not since the massive jump from Windows 3.1 to Windows 95 have we seen such a radical overhaul of the operating system itself.

It's a change that, for some, may be too much. With Microsoft recognising the ever-evolving mobile space, from smartphones to tablets, and a future where this is only going to grow, the company has decided to focus Windows 8 as a mobile-centric operating system with its new Metro interface.

On one hand, this is hard to argue against: Metro is far better suited to devices like tablets than any current Windows version and with touch being the primary method of input, it's fair to say Metro does do a pretty good job of catering to this market.

But Microsoft's vision sees Metro as the default interface for standard desktop computers, too, and it's here more than anywhere else that we've seen divisive discussion over just how genius, or crazy bad, this really is. After all, desktops aren't primarily driven by touch; instead, mouse and keyboard reigns supreme and although the 'traditional' desktop can still be accessed in Windows 8, Metro remains the default and what you'll see when you log in.

So come October, are you going to upgrade to Windows 8? Does it do anything that you feel you need that Windows 7 doesn't do? Do you just prefer to use the latest and greatest, or are you more practical and will stick with what works now?

Let us know your thoughts on our forums at apcmag.com/forum.htm. In the meantime, here's our breakdown of the pros and cons of upgrading – or not upgrading – to Windows 8.

video

Apparently misnamed, the Video app is there to push purchasable content on you.

movies mark



Wrath of the Titans



Falling Skies



Salmon Fishing in the Alps



Breaking Bad



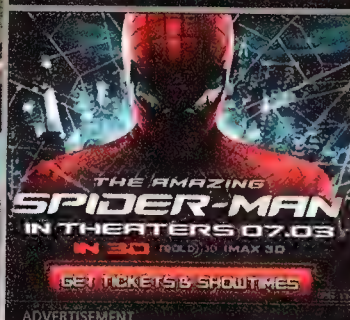
American Reunion



Silent House



Louie



ADVERTISEMENT



21 Jump Street



Lockout (Unrated)

Reasons to upgrade

Microsoft hasn't been idle with Windows 8. Metro is the most prominent change, but it's not the only one. A lot of work's been done under the bonnet, too.

01

SPEED

One title Windows 8 can fairly claim is that it really is the fastest Windows yet. Not just in general usage, which for the most part is slick and seamless, but also in functions such as boot time, which can be a matter of seconds depending on the hardware. Part of the reason for this has been a sustained focus on performance during development and partly due to requiring Windows 8 to be as lean as possible for fast operation when running on mobile devices like tablets. We can thank Microsoft's mobile-focused development for the fastest desktop Windows ever.

02

BETTER MEMORY MANAGEMENT

Again, thanks to the mobile focus, Windows 8 has much improved memory management that will not only benefit Metro apps, but the operating system as a whole. Windows 8's memory footprint, even with Metro and the default desktop loaded, is smaller than Windows 7. It's good news for laptops and tablets, and good news for desktops with more memory free for the programs you run.

03

IMPROVED POWER EFFICIENCY

Tablets and phones aside, Windows 8's improved power efficiency will also see laptops last longer. Windows 8 will suspend Metro apps and desktop programs when a PC is put into sleep mode, allowing the CPU to drop into a lower-power state and save juice. Microsoft has also added a Connected Standby mode that enables certain applications, like the Metro email client, to receive updates even while a device is technically asleep.

04

BETTER TOOLS

Along with a focus on speed, Microsoft has addressed a lot of niggling issues with previous Windows versions. These changes range from tools like the Task Manager all the way through to network settings: for example, the former is greatly improved, making it easier to identify problem programs and see what apps use what percentage of your system's resources, while the latter sports new bandwidth counters for Wi-Fi and mobile networks, and the ability to toggle an Airplane mode (not just for flying, doing so saves power for mobile devices, too).

05

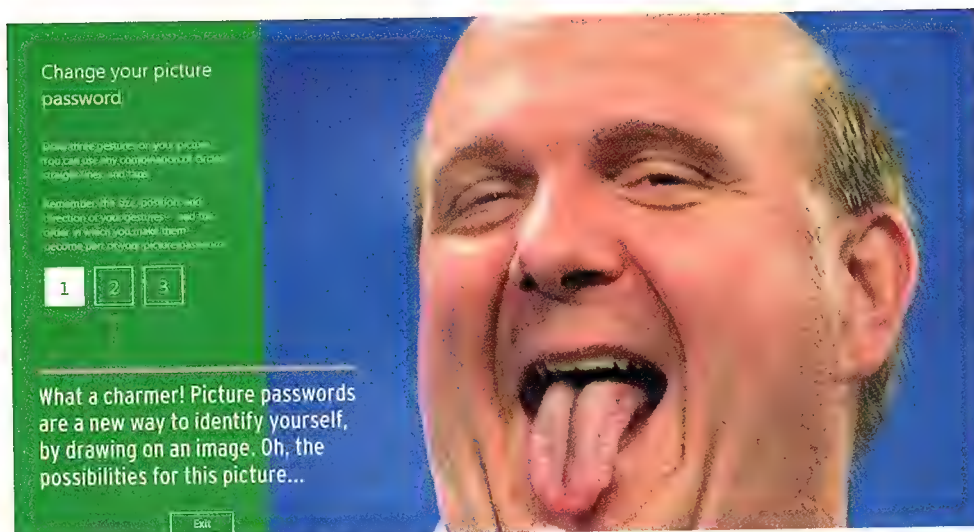
ENHANCED EXPLORER

Numerous upgrades to Explorer in Windows 8 see the ability to monitor multiple file transfers from a single dialogue, as well as pause any transfer mid-copy, even over networks; greatly improved file copy dialogues, especially when it comes to overwriting similar files at the destination; a new Office 2010-inspired common function Ribbon (optional, thankfully) and the integration of new features like File History. On the whole, Explorer looks much the same, but is much more useful and functional.

06

DEVICE SUPPORT

Multi-monitor support is finally improved, with the ability to extend the taskbar and desktop backgrounds across multiple monitors without the need for any third-party apps, or, alternatively, you can display the Metro desktop on one monitor and the classic desktop on another monitor. USB 3.0 is also included natively in Windows 8, meaning you will no longer need to install after-market drives just to get your USB 3.0 devices recognised.



09

INNOVATIVE NEW TECHNOLOGIES

NTFS finally has a successor in ReFS, the Resilient File System. While initially intended for server platforms, Microsoft has stated that in time it will eventually become the de facto standard for Windows across the board. Storage Spaces allow you to take advantage of a variety of media from internal hard drives to external USB devices to create a single 'storage pool' for your system, a great way to put old drives and disparate storage devices to good use. The new Picture Password unlocking system allows you to draw on a photo as a means to prove your identity.

10

WINDOWS STORE

Microsoft has learnt from Apple and now has its own store. Like it or not, there's heavy emphasis for developers to write programs that will sell via the store and while this is something we definitely like, it's worth remembering that only Metro apps will be available via the Store. Over time, this will cement Metro as the de facto platform for Windows programs. That should be interesting, as not all programs would be clearly ideal using a Metro-style interface. But if you like the purchase-and-download paradigm, it's finally here for Windows.

11

CONSISTENCY

If you like using Windows and plan to get a Windows tablet and/or smartphone, there's something to be said for using the same interface across your desktop, phone and tablet. Furthermore, with Microsoft's integrated cloud support elements, like your browsing favourites, settings, preferences and apps can be synced across all three for a consistent experience.

12

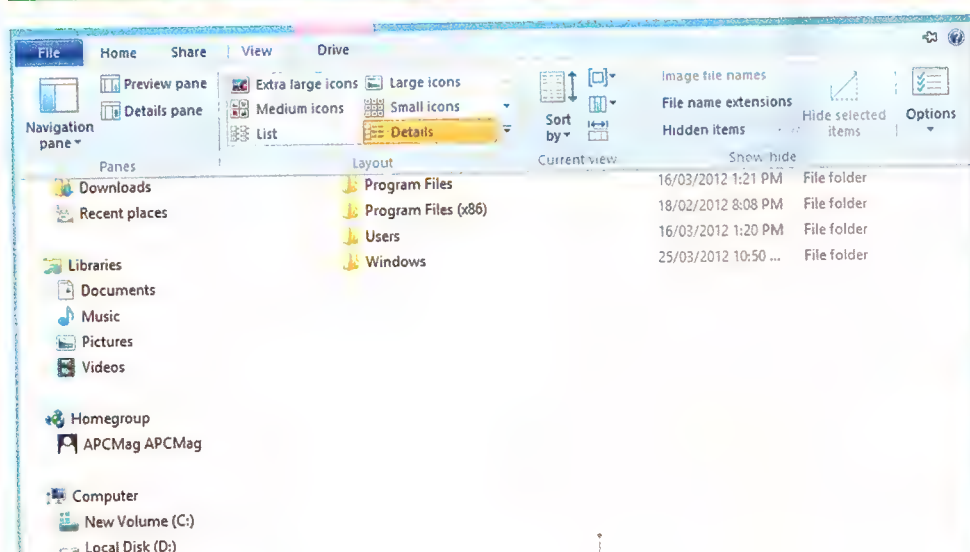
PRICE

We think we saw pigs flying (or perhaps penguins, foreshadowing that 'other' operating system) when Microsoft announced the pricing structure for Windows 8 – for the first time in Microsoft's history, the latest flagship Windows appears to be reasonably priced. Pay hundreds of dollars no more: users of Windows XP, Vista and 7 (ie. everyone) can upgrade to Windows 8 Pro for just \$39.99. And, to ensure those who are currently in the market to buy a new PC don't miss out, any PCs purchased in the next six months with Windows 7 will be entitled to a Windows 8 Pro upgrade for just \$14.99. Nice one, Microsoft.

13

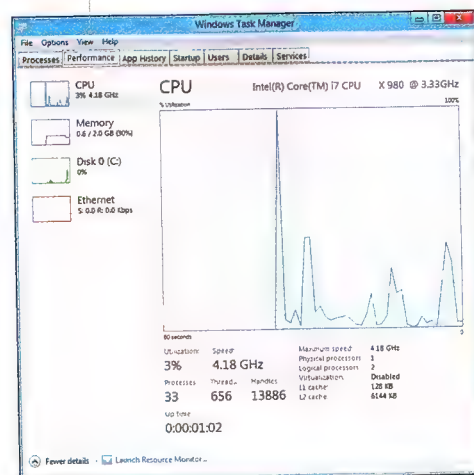
FUTURE-PROOFING

Let's face it: like it or not, this is Microsoft's latest Windows. It will be bundled on all new PCs and over time will become the dominant platform. You can probably get away with using Windows 7 for a few more years yet, but over time, more and more programs will be built for Windows 8 as a base platform.



Under the bonnet, many of Windows' standard features have received an upgrade, including Explorer inheriting the Ribbon.

The new Task Manager is unequivocally sexy.



07

BETTER RECOVERY OPTIONS

Perhaps an admission with how regularly Windows users need to reinstall Windows, Windows 8 comes with improved recovery options including restoring a PC to a clean install state, or performing the equivalent of a factory reset, but keeping all your installed apps and preferences. And both of these can be done from a recovery menu built into Windows 8 – no more searching for or creating a bootable OS disc. Fixing your Windows installation has never been easier.

08

BETTER BACKUP

Gone is the kludgy, basic Windows backup tool and in its place is an advanced, Microsoft version of Apple's Time Machine: File History with its continuous backup and ability to revert to file versions through a variety of snapshots in time. Not only is it a fire-and-forget solution, but restoring files is a breeze with an intuitive interface that lets you view snapshots and the contents of files before you restore them. Further, it can work with external drives, network devices and the new Windows 8 Storage Spaces feature.

Reasons to hold off

There are some compelling reasons to upgrade to Windows 8, but there are some equally compelling reasons not to.

01

METRO FOR DESKTOP

Metro's Start screen is the default 'desktop' for Windows 8 and this currently can't be changed. If you prefer the classic Windows desktop – at least for your desktop PC – you're pretty much out of luck. There are hacks to try and forcibly boot into the classic desktop, but these are exactly that: hacks. Right now, Microsoft wants you to use Metro, whether you want to or not.

02

NO 'START' MENU.

Not only is the classic Windows desktop hidden as an 'app' in Windows 8, but even when you jump into it you'll find the classic 'Start' menu is no more, making it a little more fiddly to find and launch your programs. According to Microsoft, the 'Start' menu – which has been with us since Windows 95 – was killed not to force a focus on Metro, but by its own metrics people weren't using it as much as, for example, pinning their popular programs to the taskbar. Whatever the reason, if you prefer the classic Windows desktop and think you'll be able to upgrade to Windows 8 and continue using it, you'll be in for a rude shock.

03

IMMATURE METRO APPS

Microsoft has made a big fanfare over the Metro versions of its apps, but they're not without problems: Video can't play formats Media Player can, Metro Mail seemingly can't connect Microsoft's own Exchange servers, Messaging is limited to Windows Messenger and Facebook only, and Internet Explorer 10 is hobbled with no Flash support (let alone how ugly IE10 Metro is regardless) due to its no-plug-ins design – you have to jump into the classic desktop, breaking the mould from Metro, and launch the IE10 'desktop' version just to watch YouTube videos.

04

YOU'RE AN AD TARGET

You'd think your operating system would put you first, but this isn't the case with Windows 8. Launch the Metro Video app, for example, and you're bombarded with paid products from Microsoft, not your collection of videos or a dialogue asking where to find them. It's the same experience for the Music app, where you have to scroll past the ads to find any option to open your own. It would seem you're just a vehicle to be

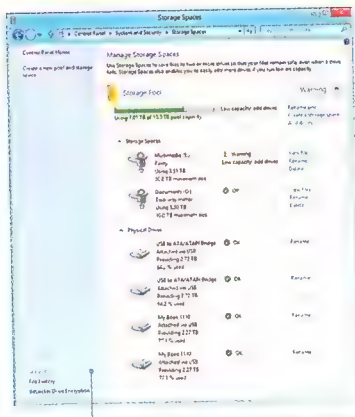
advertised to. Further, and for reasons known only to Microsoft's clearly confused management, you need to create an Xbox Live account *just to access the app*. What the? What if I don't care for or use Xbox Live for anything? Can I please just play my videos? Surprisingly, the Photos app doesn't include a cavalcade of Steve Ballmer pictures – surely that's a missed opportunity for Microsoft.

05

CONFUSING CONSISTENCY

Undoubtedly, the majority of users will be sticking with their familiar desktop programs. While in time some of those preferred programs could get a Metro equivalent, while many may take some time to appear – if they appear at all. Users running 'desktop' apps on Windows 8 will find themselves flicking between the classic desktop and the new Metro 'Start' screen, two completely different-looking and -operating interfaces. Additionally, even some of Microsoft's own tools don't remain consistent; for example, there are now two Control Panels and to confuse things further, the desktop version can be launched from the Metro version, but not vice versa. Some





Storage Spaces make it easy to create your own pool of central storage from disparate devices.

There are now two Control Panels: one for Metro and one for desktop Windows, but no central place to manage everything.

Store

Spotlight



The Windows Store will make it easy to purchase and download programs, but only for Metro.

PC settings

- Personalize
- Users
- Notifications
- Search
- Share
- General
- Privacy
- Devices
- Ease of Access

Sync your settings

Sync settings on this PC
On

Settings to sync

Personalize
Colors, background, lock screen, and your account
On

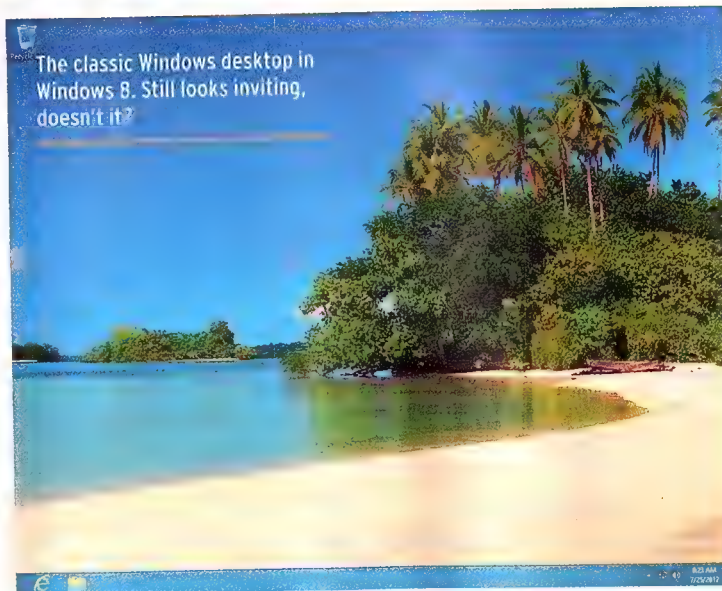
Desktop personalization
Themes, taskbar, and more
On

Ease of Access
High contrast, Narrator, Magnifier, and more
On

Language preferences
Keyboards, other input methods, display language
On

App settings
Certain settings in your apps
On

Browser settings



settings can also be found in both, while others are only found in one or the other.

06 UEFI LOCKDOWN

The Unified Extensible Firmware Interface, successor to the aging BIOS that most computers have, allows for an operating system to tie directly into the hardware firmware. One of the exploits of this for Windows 8 is to try and prevent malware that runs at boot time, thereby aiding security. However, the flip side is that UEFI can be configured to not boot any operating system that hasn't been signed – this directly impacts Linux, which due to its open-source nature, can appear in many forms and usually doesn't have a central body that's willing to pay to have signatures added to UEFI firmware. Red Hat and Canonical (makers of Ubuntu) are working on a solution for this, but it still leaves many other distributions

07 NOT ESSENTIAL

Ultimately, the most compelling reason not to upgrade from Windows 7 is the simplest: Windows 8 doesn't do anything for you that the current version of Windows 7 you already have can't already do. Regardless of whether you're using Windows on your office computer, as a desktop computer at home, for gaming, or when you're on the go on a laptop, Windows 8 really doesn't offer much incentive. The exception is for tablets, where clearly Windows 7 isn't right for the job anyway and Windows 8 is ideal. So if you're in the market for a Windows tablet, we'd suggest that you definitely get one based on Windows 8. For everything else... well, do you think you really need it – and now?

IT'S UP TO YOU

Invariably, Microsoft is stuck between a rock and the giant raging steel bull of progress. If Microsoft didn't try for the mobile market with Windows 8, it would die a slow death left behind Apple and Google. At the same time jumping completely onto the mobile bandwagon, and the new interface it requires, when the whole world is used to the traditional Windows design would also be suicide as it would cannibalise the current market. The result is that Windows 8 is a confused twisted twin of the two, more resembling a Frankensteinian creation that isn't quite fully one way or the other than a cohesive whole. Be that as it may, there's one thing we can acknowledge Microsoft for: at least it's innovating again.

But ultimately it comes down to you – is it enough of a change for you to upgrade? Tell us why – or why not – on our forums at apcmag.com/forum.htm. **APC**

MOBILE MALWARE

Security threats common to the web are now attacking smartphone users. **Jenneth Orantia** explains the dangers and what you can do to prevent them.

You know that smartphone in your back pocket? If it happens to run Android (and there's a 38.8% chance it does, according to IDC's latest Aussie statistics), then cyber criminals have you firmly in their crosshairs.

IDC's latest Worldwide Quarterly Mobile Phone Tracker puts Android as commanding 59% of the smartphone market share, with a little under 90 million devices shipped globally in the first quarter of 2012 alone.

This, among other things, makes Android a lucrative target for cyber criminals. Other factors include the platform's open-source nature, which makes it easier to find and exploit vulnerabilities; loose security policies for apps, enabling hackers to distribute malware through both the official app store and external sources; and a low awareness of smartphone security threats, giving criminals ample opportunity to make a lot of money in a short amount of time.

Thomas Parsons, security response manager at Symantec, says the malware situation is ramping up rapidly. "Up until the end of May, we'd seen about 16,000 unique samples of Android malware. And the number we've seen in the last four weeks is almost the equivalent of everything we've seen in volume for the Android space to date."

In its Quarterly Threats Report for Q1 2012, McAfee saw a steep 1,200% increase in Android malware in the first three months of this year. Michael Sentonas, chief technology officer at McAfee Asia Pacific, says many of the unofficial Android app stores are teeming with malware. "I've seen interesting statistics where in some countries, there

are app stores where over 60-70% of the applications are fake or malicious in nature," he said. "In China in particular, there are a number of app stores where a significant amount of the apps are fake."

THE MANY HEADS OF MOBILE MALWARE

Mobile malware can come in a variety of forms, including Trojans, viruses, adware, scareware and spyware. F-Secure's Mobile Threat Report Q1 2012 lists Trojans as the most popular threat by far, making up 84% of the threats detected in that time period.

The effects of malware can be just as varied and usually manifest unknown to the user. "Now that smartphones are so powerful, we're seeing incidents of rootkits for smartphones that have similar functionality to the rootkits we've been seeing on PCs for years," says Michael McKinnon, security advisor at AVG.

"We're talking about malicious applications that can be hidden from plain view, which can do things like send premium SMS messages without you being aware, read your SMS messages and transfer them on the internet, have full data communication, and report on your GPS location."

Rogue Android apps have also been reported to do things like record phone calls, forward incoming mail, download and install further malicious software, load pages with fake banking web sites, and even turn your phone into a botnet to do things like perform denial of service attacks.

And it's not just the apps that you download from dodgy places, either.



Many rogue apps are finding a home for themselves in the official Google Play Store.

MCAFFEE REPORTED A STEEP 1,200% INCREASE IN ANDROID MALWARE IN THE FIRST THREE MONTHS OF 2012



Uninstall the fake security app Android Security Suite Premium.

Many of these apps are finding a home for themselves in the official Google Play Store, often masquerading as free versions of popular apps and games like *Angry Birds* and Netflix.

Advertisements in free apps and games are also being used by cyber criminals to peddle malware. "In the last month, we've noticed an increase in the amount of apps with adware," says Liviu Arsene, malware researcher at BitDefender. "In our top 10 mobile malware stats, adware is in first place." Last year, the legitimate ad-sponsored versions of *Scrabble* and *Angry Birds* were found to be displaying ads for a fake 'Battery Doctor' utility that harvested the user's phone number, email address, handset IMEI number and contacts.

Some of the latest incarnations of Android malware include the following:

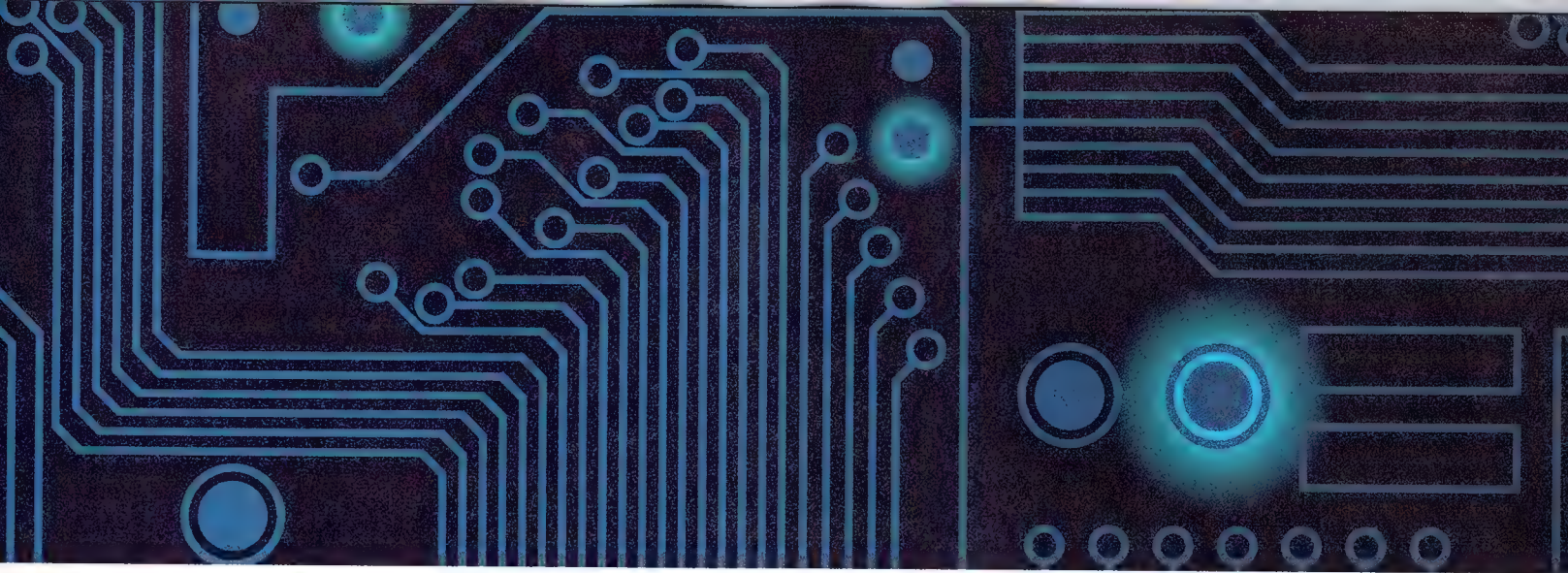
- Android Security Suite Premium, a fake security app that forwarded incoming text messages to remote servers.
- A fake Gmail app that silently sent the user's SMS records, call log and email to an email address, with further capabilities that could be activated from command and control servers operated by the scammer.
- A fake Instagram app that sent messages to premium numbers without the user's knowledge.

GOOGLE'S RESPONSE

In February, Google announced a new layer of security in the Play Store codenamed Google Bouncer. According to Google Mobile's blog post, this technology automatically scans every new Android application uploaded to the store and analyses it for known malware, spyware and Trojans. It also simulates how the app will run on an Android device to look for any hidden malicious behaviour. Between the first and second half of 2011, Google claims that Bouncer reduced the number of malicious applications in the Play Store by 40%.

However, it didn't take long for workarounds to be discovered. In June, two security researchers from Duo Security found multiple ways for





malware authors to beat the system, including getting the app to check whether it was running in the Bouncer virtualisation software, checking the account used to register the virtual phone and getting the app to suspend any malicious behaviour for the first five minutes that Bouncer scans the app.

THE LOCAL SITUATION

Most of the Android malware reported so far has originated in non-English-speaking countries – Russia and China in particular appear to be the two main nesting grounds – and this language barrier has served to reduce the number of potential victims.

But that doesn't mean Aussies and other English-speaking Android users are safe. McKinnon says AVG has come into contact with Australian customers that have been affected by smartphone malware, but that most of them were keeping quiet about it. "One of the issues we see in Australia is that a lot of this is not reported," he said.

In some situations, it's a case of not even realising that your phone has been infected. As noted by Sean Sullivan, security advisor at F-Secure Labs, one of the more alarming trends in recent months is malware apps that 'deliver on their promise'. "Today what we're seeing are malicious Android apps that have bundled legitimate apps, such as Rovio's *Angry Birds Space*," he said in F-Secure's Mobile Threat Report Q1 2012.

"First the malicious 'wrapper' tricks and manipulates the user into granting permissions that allow the malware to subscribe to premium-rate services, but then the malware actually does install a working copy of that game. At this point, there is little to be suspicious of and nothing to troubleshoot. The user gets the game that he was promised. With this new paradigm, it remains to be seen just how long it takes victims to realise they've been victimised."

Checking your phone bill is one way to check whether you've been the victim of a premium SMS scam, but even this has its drawbacks. "For a lot of us, it's just annoying," says McKinnon. "If you check your bill at the end of the month, and you see that there are a couple of SMSs that you can't identify, you might not immediately equate that with a rogue app on your phone."

Premium SMS scams are proving to be an attractive monetisation technique for cyber criminals, as they can get mobile carriers to do all the money laundering for them. They set up the premium rate numbers, distribute the malware, rake in the charges and disappear long before victims receive their phone bills.

"It's a hit-and-run situation," says McKinnon. "The goal of a scammer who is producing this malicious software is skimming a small amount of money from as many people as they can. They're taking advantage of the immense leverage of the

network and the app stores. If they can skim 30c or \$1 off everyone they infect, they might make \$10,000 in that one crime."

THE OTHER GUYS

OK, we get it, Android smartphones are ticking time bombs. Does this mean you're in the clear if your smartphone runs a different operating system? Not necessarily. You're probably safer, in the same way that Mac is safer than Windows, but that's purely because hackers tend to target the low-hanging fruit, which in this case is Android.

"We don't hear much about iPhone malware because in terms of the ease of infecting someone, cyber criminals always go for the path of least resistance," said McKinnon. "At the moment, this path is getting a hold of Android apps and modifying them into rogue apps, or creating them from scratch."

But iOS is no stranger to malware. Last year, iOS security researcher Charlie Miller was able to sneak a proof-of-concept app onto the App Store that purported to track stocks. In the background, however, it downloaded third-party malware onto the victim's iPhone that accessed and edited sensitive data, as well as triggering random push notifications. Apple subsequently issued a software update that patched the security vulnerability.

More recently, certain iOS apps, including the popular Path image sharing app, were discovered to be uploading entire contact lists to remote servers. This wasn't necessarily malicious, as the apps were doing this to enable certain features in the app, but it was done without users' consent. Apple promised to update iOS to require user approval before apps can access contact information, similar to the dialogue box that exists now for apps that require access to your location.

In May, the chief technology officer for Kaspersky Lab, Nikolay Grebennikov, told Computing.co.uk that the company expected iPhones and iPads to be infected by malware within the next year. "Our experience tells us that in the near future, perhaps in a year or so, we will see the first malware targeting iOS," he said.

Even users with 'dumb phones' aren't immune and can be scammed using a combination of SMS and social engineering. SCAMwatch, a web site run by the Australian Competition & Consumer Commission, warns of a 'voucher prize' scam text message currently making the rounds that signs you up to a mobile premium service when you enter your number into a web site to claim your prize.

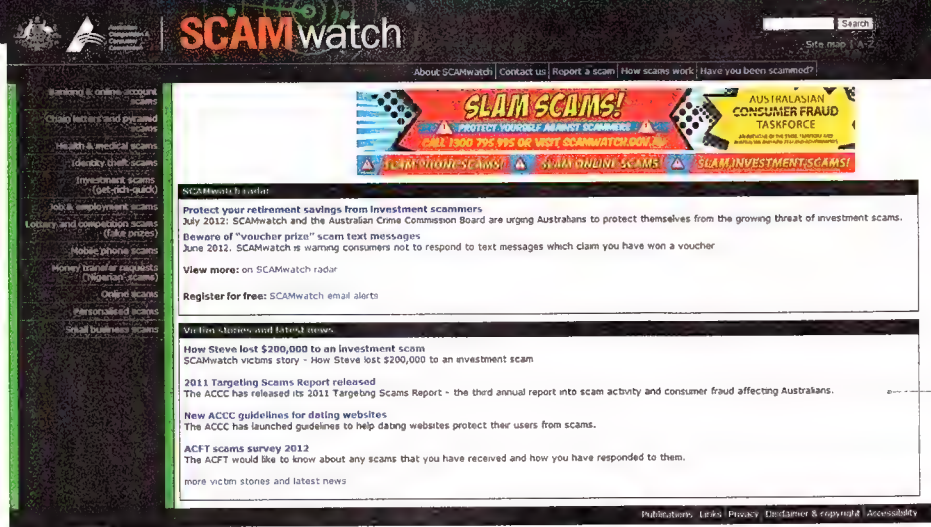
TURNING THE TIDE

It's not all gloom and doom. Authorities around the world are catching on quickly and punishing the perpetrators of malware with hefty fines and jail sentences.

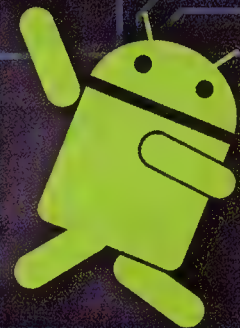
In May, fake apps masquerading as popular



When users opened a fake app, it sent text messages to a premium service.



Web sites like SCAMwatch are good for finding out about the latest SMS scams.



games like *Angry Birds* and *Cut the Rope* were discovered in the official Google Play Store. When users opened one of the games, it would send three text messages, costing £5 each, to a premium service based in the UK, with no evidence of the outgoing or incoming messages appearing in the user's messaging app.

This scam was identified in 18 countries, downloaded an estimated 14,000 times and made £28,000 from its victims in the UK alone. PhonepayPlus, the premium rate phone services regulator in the UK, fined the premium service provider A1 Agregator £50,000 and ordered it to repay all victims within three months.

In June, six men were arrested in Japan in connection with an Android malware scam. The app was distributed on a porn web site that purported to be a raunchy video player. When the users opened it, the app would display a message demanding payment of ¥99,800 every five minutes – even when the phone was turned off. It also sent the user's personal information to a remote server. Out of the 9,252 people that installed the app, 211 fell for the con, making the scammers ¥20 million (\$265,000).

HOW TO KEEP YOURSELF SAFE

Short of switching your smartphone off permanently, there's no one single step that will keep you safe from mobile malware and scams. But there are a range of best practice techniques you can employ that will minimise the chances of infection.

- Download apps from the Play Store only. This lets you take advantage of Google's Bounce security technology, which scans apps for known threats before they're published. Failing that, only download apps from the web sites of developers that you've heard of and trust.
- Check the app's ratings and reviews. Just because it's in the Play Store, doesn't mean it's not malware. If there's more than one version of the same app or game listed in the search results, go for the one with the most downloads. Apps that have an 'Editor's Choice' award or are in the 'Staff Picks' section are the safest bets, as these have been independently verified and recommended by a human.
- Be especially careful about apps that you download from external sources, as this is where most of the Android malware is found. If it's

available for free when it's usually a paid app, then there's a good chance it's malware.

- Don't click on links sent to you from unknown sources via SMS or email. This may take you to a fake landing page designed to look like a bank, or to a page that falsely says you've won a prize. In both cases, the site is trying to harvest personal details like your phone number and banking details.
- Turn off the setting that lets you install apps from unknown sources. This won't prevent drive-by downloads that occur when you visit a particular web page, but it will prevent you from installing the app accidentally. If you ever need to install an app outside of the Play Store – an avenue that many legitimate developers use to distribute beta software – you can simply turn this setting back on temporarily.
- Check the permissions that apps are requesting before you download them. The permissions to keep an eye on in particular are services that cost you money, your personal information, phone calls, your location, your messages and your accounts. It's a matter of common sense – does a photo editor really need access to your phone calls?
- Install a third-party security solution. All of the major security software vendors now offer mobile security suites for Android that scan apps and app updates for known threats before you install them. Extra antimalware features vary between vendors. Norton Mobile Security includes web protection that blocks fraudulent and phishing web sites, while AVG Antivirus for Android offers SMS scanning for suspicious messages.
- Check your phone bill on a regular basis. If there are mobile premium services listed there that you don't remember subscribing to, contact your carrier straight away. If you don't use premium SMS or MMS at all, you can also ask your carrier to block them from your service as an extra safeguard.
- Treat any text that says you've won a prize or the lotto with a healthy dose of scepticism. Web sites like SCAMwatch (www.scamwatch.gov.au) are a good resource for finding out about the latest SMS scams.
- Don't trust ads just because they appear inside legitimate apps – many cyber criminals are now using affiliate ad networks as a vehicle for distributing malware. **ETC**

Experts solve your computing problems

APC and its readers can be one giant helpdesk. If you have a technical problem, chances are one of us can solve it.

SECURITY

SURF SAFELY IN PUBLIC

Q I travel from time to time and stay in hotels and motels that have free, but unsecured, wireless internet. I therefore just use the internet for research and don't attempt any sensitive connections such as my bank accounts, even though I sometimes really need to look at them. My question is, since I cannot change the hotspot's router settings, is there a way to securely use the hotel's wireless connection?

Gerald Gibson

A The best way to protect yourself when surfing through an open Wi-Fi network like the one you described is to use a VPN connection. This is a special, encrypted connection that is designed for people to securely transmit and receive sensitive information over the internet. VPN services

usually require a monthly subscription to use, but there are free services available for those who only need occasional access.

One such service is Your-Freedom (www.your-freedom.net). If you sign up for a free account, you can connect through it for up to six hours in a single day, or 15 hours over the course of a week. The simplest thing to do is download and install the client software from the web site. Run through the setup wizard – the default options are fine in most cases – and then log in with your account whenever you wish to surf securely.

WINDOWS

MISSING MEDIA CENTER

Q I own an Acer Aspire laptop. There seemed to be a problem with Windows Media Center, in that the cursor disappeared from the screen and the mouse didn't seem to be working properly, so I made

space by removing the program using the Control Panel. Now I've realised I could use a remote control with it, so I'd like to replace the missing program (as well as Windows Media Player, which has also vanished). I've spotted a few media centre programs to download from the internet and don't mind paying, but some look a bit dodgy. Which would you recommend and what TV tuner do I need?

David Taylor

A Your problem was probably caused by having enabled mouse trails on the 'Pointer Options' tab of the 'Mouse' applet in Control Panel. Switching this off should resolve it, or you can switch to using a Windows remote control if you prefer.

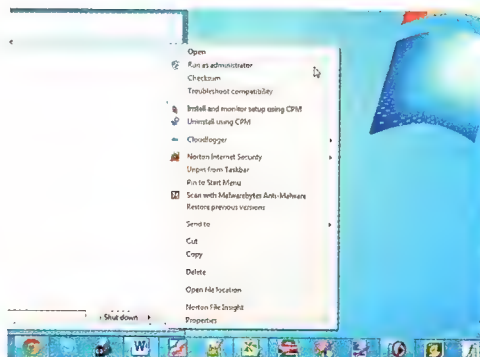
Both Windows Media Player and Windows Media Center can be restored from the 'Programs and Features' applet. Click 'Turn Windows features on and off' and wait for a list to appear. Expand 'Media Features', then

STEP BY STEP: CLIPBOARD WOES

Q Recently, whenever I try to cut and paste anything into a Microsoft Office document, it appears as a black blob-like image. How do I resolve this?

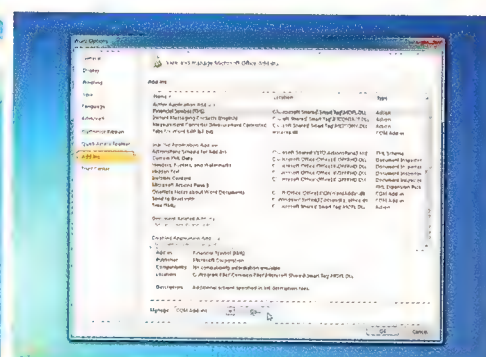
Derek Archer

A This is caused by a faulty Bluetooth driver, which installs an add-in in Microsoft Office. Try updating your computer's Bluetooth drivers, if possible. If this doesn't work, follow the step-by-step guide on the right to remove the Bluetooth add-in manually.



01 LAUNCH MICROSOFT OFFICE

Click 'Start' and type `winword` into the 'Start search' box. When it appears in 'Programs', right-click it, select 'Run as administrator' and click 'Yes' or 'Continue' when prompted, to launch it with the privileges it requires.



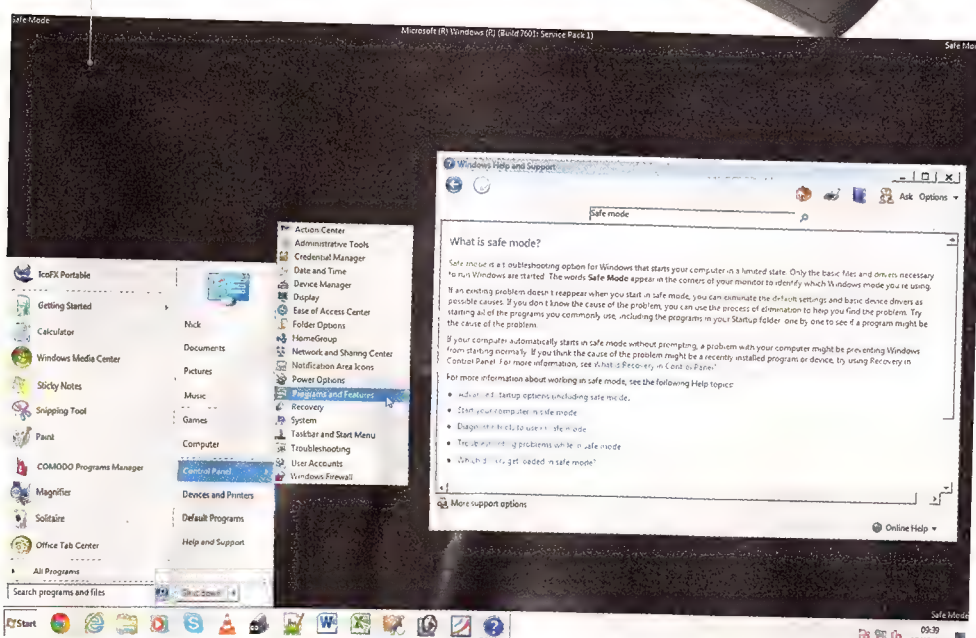
02 OPTION CHOICES

Office 2010 users should click the 'File tab > Options'. In Office 2007, click the 'Office' button followed by 'Word Options'. Choose 'Add-ins', select 'COM Add-ins' from the 'Manage' menu and click 'Go'.



WATCH TV: Hauppauge's NOVA-T stick adds a TV tuner to your PC.

SAFE MODE: Fix troublesome gremlins with the help of Safe Mode.



QUICK QUESTIONS

I've just upgraded to Microsoft Word 2010. Can you tell me how to change the default tab stops to 10mm instead of the default 12.7mm?
Hugh Walker

Click the 'Show Paragraph' dialogue box (it's the button next to 'Paragraph' on the 'Home' Ribbon) and click the 'Tab' button, where you'll find the control you need.

How do I search appointments in Windows Live Mail Calendar?
Richard Phillips

Sadly, it's not possible to search the Calendar – either in Windows Live Mail or via the Windows Live web site. If you want a calendar with that functionality, try Google Calendar (calendar.google.com), which comes with its own web app for Google Chrome.

Can you recommend a suitable QR code reader for my Windows 7 laptop, which has a built-in webcam?
Bernard Powell

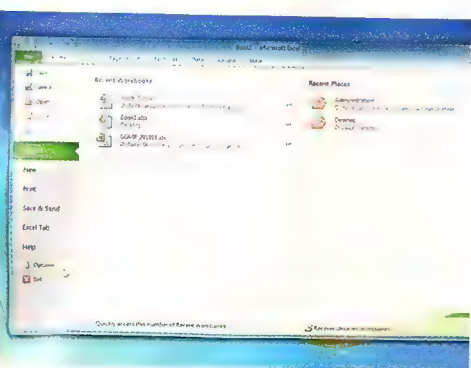
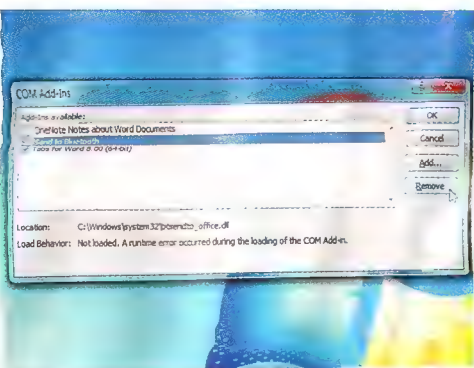
BcWebCam Free Edition (www.bcwebcam.de/en) can be used to read both traditional barcodes and QR codes from your webcam. If you want to decode a QR code in an image or .PDF file, try bcTester Application, available from the same company.

Is it OK to run the following three security tools together: Avast! Antivirus, Threatfire and AVG LinkScanner?
Harry Schlegel

Yes – Threatfire is designed to run alongside existing antivirus software, while AVG LinkScanner simply adds protection to your browser by checking web sites for safety and privacy concerns.

I wish to switch from AVG Anti-Virus Free to Avast! Free. Can you please point me in the right direction?
Philip Good

You can download Avast! Free from the link provided at tinyurl.com/yefy6oy. If you have trouble removing AVG, download the free AVG Remover Tool (www.avg.com/ww-en/utilities) to purge the program from your system.



03 DISABLE BLUETOOTH ADD-IN

You should see a 'Send to Bluetooth' option with a tick next to it. Unticking simply disables the add-in. Click on the option to select it and click 'Remove' to uninstall it. Click 'OK' twice and close Microsoft Word.

04 REPEAT THE PROCESS

You need to remove the add-in for each Office application. Repeat the previous steps, searching for these programs if applicable: powerpnt.exe, excel.exe, onenote.exe, outlook.exe, mspub.exe and msaccess.exe.

howto quicktips

tick both programs and click 'OK' to bring them back again.

If this doesn't work, or you fancy trying a different solution, there are two excellent free alternatives to Windows Media Center: MediaPortal (www.team-mediaportal.com) and XBMC (xbmc.org). When it comes to TV tuners, try Hauppauge's WinTV-NOVA-T digital stick; however, you'll need to hook it up to your home aerial to get a decent signal.

WINDOWS

NETWORK ON DUAL-BOOT

Q I have a dual-boot setup running Windows 7 on one partition and Windows Vista on the other. I can connect to the internet fine with Windows 7, but when I boot into Windows Vista I am unable to. When I click 'Diagnose communication problems', I'm told that there might be a problem with one or more network adapters on my computer and sure enough, the Realtek network adapter entry in Device Manager has a yellow exclamation mark and Code 10 error. Please help because it's a real nuisance.

Douglas

A Douglas has thoughtfully provided a Belarc Advisor profile of his PC, enabling us to easily identify the motherboard as an MSI P55-GD80. We directed him to its product page (tinyurl.com/cx7nwg9) while booted into Windows 7, then instructed him to download the network and chipset drivers for the version of Windows Vista – 32-bit or 64-bit – he had installed.

Once downloaded, Douglas made sure they were in a folder he could access from his Windows Vista partition, then rebooted and installed both drivers. As soon as these were in place, he found his network drivers working correctly and internet access restored.

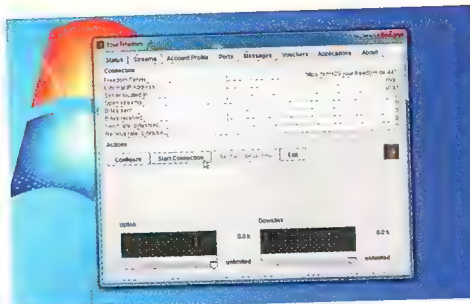
SOFTWARE

SLUGGISH COMPUTER

Q After installing a backup program called Diino, my Windows 7 PC has slowed to a crawl. Unfortunately, it's so unstable my computer keeps hanging and crashing, making it impossible to remove. What can I do to shift this from my computer?

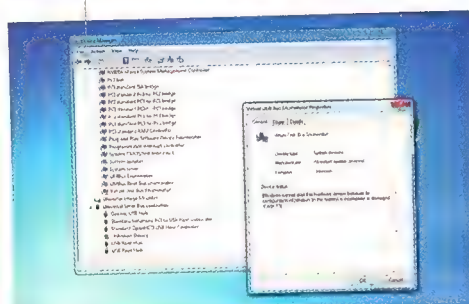
Jack Bloor

A Restart your computer and make sure you tap the F8 key when it first starts until the 'Advanced Boot Menu' appears. Select either 'Safe mode' or 'Safe mode with networking' if your computer is connected in



SAFE SURFING: Use Your-Freedom to surf unsecured public hotspots safely.

ERROR CODES: Device Manager error codes help you diagnose the problem.



TECH GLOSSARY

BELARC ADVISOR

A free program (www.belarc.com) that provides detailed system information about the PC it's installed on, displayed in a web browser.

COM ADD-IN

A program designed to extend the functionality of one or more Microsoft Office applications.

MAPI

Mail Application Programming Interface – a protocol that allows programs to interact with email applications, such as Outlook.

QR CODE

A Quick Response code is a square matrix barcode, capable of storing lots of data. You see them in adverts, magazines and more.

VPN

A Virtual Private Network is a special kind of encrypted connection that allows users to safely use insecure networks including public Wi-Fi hotspots.

WEBMAIL MAPI: Integrate your webmail account into the Windows desktop.



such a way, because it can connect to the internet in this mode.

Once in Safe Mode, you'll be able to remove the programs you suspect are cluttering up your computer using the 'Programs and Features' applet. We also suggest you run a full scan with your security tools to ensure there's nothing nasty going on behind the scenes.

Finish by running a full disk check. Click 'Start > Computer', right-click your hard drive and select 'Properties > Tools tab'. Click 'Check Now', tick both boxes and click 'Start', scheduling the check for the next time you restart your computer when prompted.

MICROSOFT OFFICE

WEBMAIL FROM WORD

Q I use Microsoft Word 2007 and when I attempt to email a document by clicking the 'Office' button and selecting 'Email options' from the 'Send' menu, it defaults to Outlook. How do I change this so I can use Yahoo web mail?

Billy Weekes

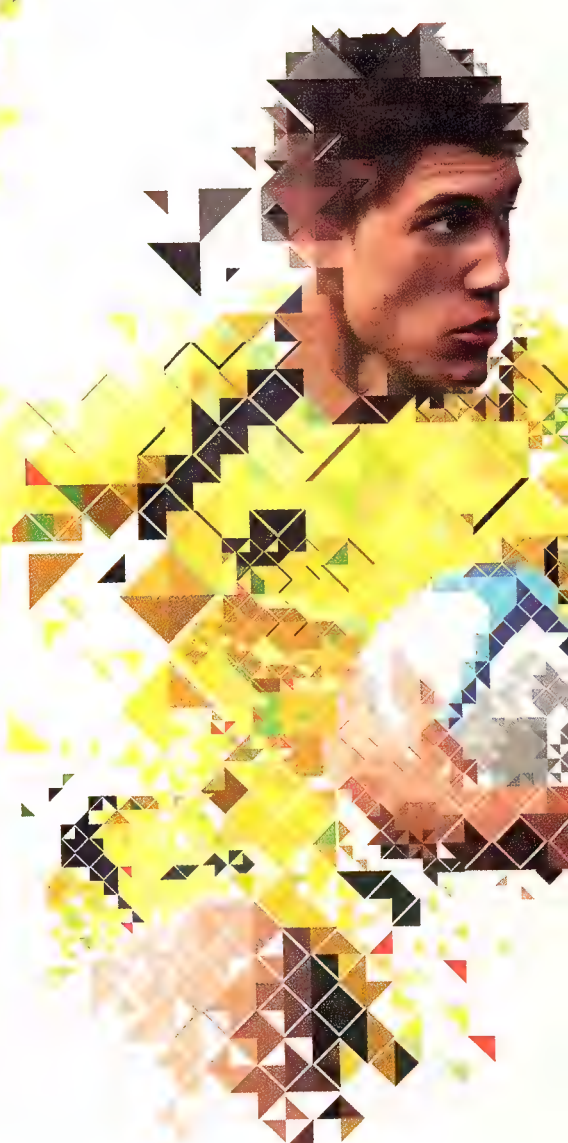
A Technically it shouldn't be possible. Options for sending files via email from within applications such as Microsoft Word use a protocol called Simple MAPI, which is supported by email programs including Microsoft Outlook and Windows Live Mail, but not by your web browser.

The good news is that it's possible to add this functionality to most web-based email accounts, including Office 365, Google and Yahoo with a program called Affixa (www.affixa.com), which is free for personal use. Once installed, the application automatically opens the Options dialogue box – switch to the 'Accounts' tab to add your webmail account. Once set up, you'll be able to attach files to draft emails in Yahoo mail from any program.

CONTACT@APGTEST.COM Share your tech tips

Have you solved a tech problem or found a better way of doing things with your computer? Share your information with other APC readers by sending it in as a tip to contact@apctest.com, together with your name

and contact details (retails won't be printed). Alternatively, if you have a technical question post it online on our forums at apcmag.com/forums and other readers may be able to solve it.



CATCH THE SEVENS FEVER

HSBC SEVENS WORLD SERIES, ROUND 1, AUSTRALIA
13-14 OCTOBER, SKILLED PARK, GOLD COAST
TICKETS FROM TICKETEK

goldcoastfeverpitch.com.au



Listen to the music

Not a fan of a Rhythmbox or Banshee? **Ashton Mills** explains the alternatives to Ubuntu's default music software.

APC EXPERT

ASHTON MILLS

Ashton Mills has been testing OSs since Slackware came on floppies. Before this he was one of the few who used OS/2 (and loved it) and before that, he remembers installing Windows 3.1 NT from 22 floppy disks. His idea of fun is to spend a weekend compiling the latest Linux kernel or testing out the latest Windows beta.

Currently the default music manager and player for Ubuntu is Rhythmbox, but not long ago Canonical standardised on Banshee. Both are good tools in and of themselves, although they're not your only options. The Ubuntu Software Center is full of music players and managers, all of which sport different features that you may find better than either of these can provide.

Here's our pick of some of the alternatives, and how they differ from the stock offering.

AUDACIOUS

Audacious is an often overlooked player and one of the few to offer plug-ins to change the way your music sounds. Purists might balk at this, but the 'Crystaliser' adds nice clarity and intensity for casual listening, similar to the Crystaliser effect built into Creative's drivers for the Sound Blaster sound cards. Other plug-ins influencing playback include stereo separation, sample rate conversion as well as a dynamic range compressor.

Key to Audacious is its ability to switch from a GTK-styled app to the classic Winamp, including the use of Winamp skins, thanks to the XMMS heritage upon which it's based.

As a music manager and player it has pretty much everything you need, playing pretty much every format you can imagine and even integrating well with Ubuntu's pop-up message queue. About the only omission is device support – you can't use it to manage or play back music from portable music players like an iPod.

AMAROK

Amarok has long been KDE's music player of choice and arguably one of the best tools we've seen on any platform. Using a unique interface to manage local music, internet-based music, files and playlists, and combining plug-ins for Wikipedia lookups, lyrics, album covers and even recommending similar artists, it pretty much covers the gamut of everything you want to do with your music as well as playing it.

Amarok also has excellent support built in for third-party

music sources including Jamendo.com, LibriVox.org, Last.fm, Magnatune.com and Amazon's MP3 store. And it can also manage your podcasts to boot, as well as stream internet radio (and for which a wide selection of stations come preconfigured).

All that's left to make it a real contender for your favourite music player is iDevice support – and while it's supposed to support music players through a range of plug-ins, we couldn't get our iPhone's music to show up the way it does with Rhythmbox.

EXAILE

Exaile is a GTK port of Amarok, so it works in much the same way, though it uses Amarok's older visual style of vertical tabs for different functions. As with Amarok, Exaile supports the management and playback of music stored locally and via internet radio streams. It can optionally display album cover art and lyrics, as well as provide common functions like an equaliser. Despite providing support for portable music devices, we couldn't get it to recognise our iPhone, however.

Overall, Exaile isn't quite as feature-filled as Amarok, but it can utilise the range of Amarok python plug-ins and importantly, as a native GTK port, it doesn't require KDE or QT libraries to be installed.

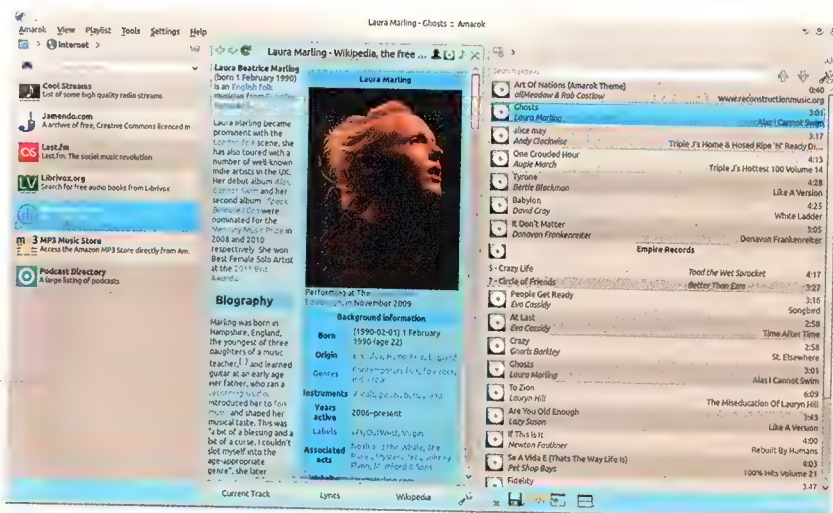
CLEMENTINE

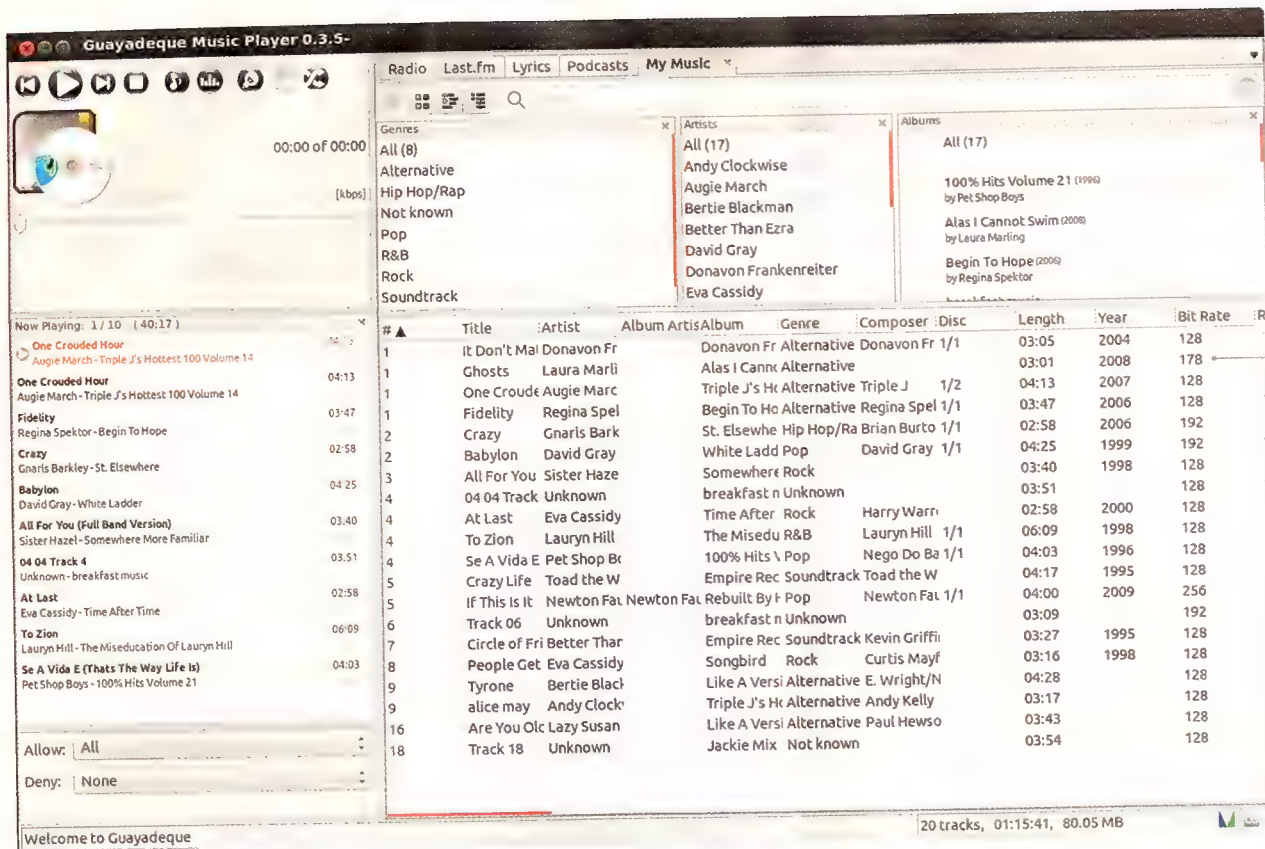
As if you need more evidence that Amarok is the king of media players, Clementine is also a fork of Amarok, utilising QT, but not relying on KDE libraries. Unlike Exaile, it's much more mature and offers the full suite of functions as the native KDE Amarok including the wide range of visualisations, built-in transcoding, easy browsing of your local library and internet media (including loads of internet radio stations to discover, much more than Amarok), and clearly laid out information panels that can fetch artist imagery, background notes on the band and lyrics. These features are enabled by default, so just clicking on a song will reveal plenty of information about the artist and display lyrics as you listen.



Audacious sports sound-enhancing plug-ins and can transform into classic XMMS (aka Winamp) style.

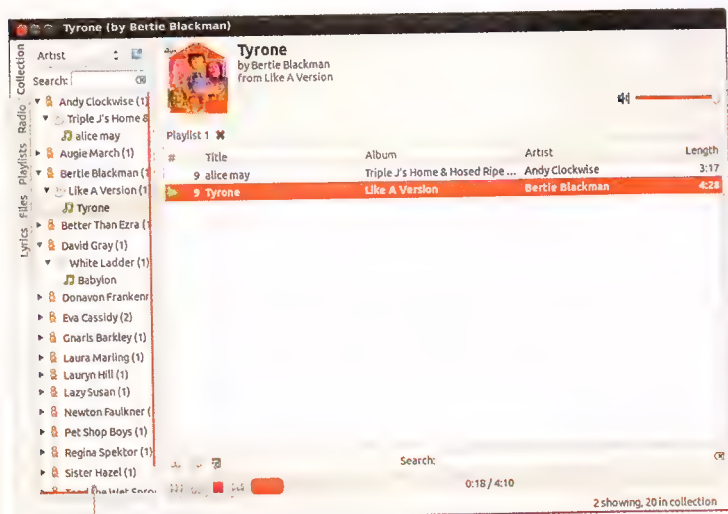
Amarok for KDE is renowned as one of the best music players and managers for Linux.





Not quite as pretty as other players, but the interface of Guayadeque belies its fully-featured core.

Clementine is an excellent port of Amarok for GNOME desktops that easily challenges Rhythmbox.



Lightweight, Exaile is a good alternative to the default Ubuntu player.

It's also the only player covered here that correctly recognised our iPhone and allowed us to manage and play music from it. And if that's not enough, it comes bundled with Wiimote support if you have a Wii controller.

Being built to run on GNOME including support for GNOME shortcut keys and Ubuntu tray and message queue integration, this is easily our pick of the bunch.

GUAYADEQUE

Funny name aside, Guayadeque is a good challenger to Amarok and its offshoots, sporting a clean layout for song management breaking down genres, artists and albums as well as providing internet radio, Last.fm, Jamendo.com, Magnatune.com and podcast support. You can browse hundreds of radio stations if you tell Guayadeque to update its stations, with a similar functionality for podcasts if you choose to add a new channel – at the time of writing there were 7,800 channels across 30 categories – making it a

great tool to discover radio and podcasts you may not have heard of.

As a music player, the basic functions are there as well as lyrics display, channel meters instead of clichéd visualisations, a highly configurable cross-fader and even a recording function.

It's not quite as pretty as Amarok or Clementine, but it's a different kind of player that may suit if these don't grab your fancy, especially for discovering new internet radio and podcasts.

Of course, one feature missing from all of these players, and presumably one of the reasons that Rhythmbox is the de facto player in Ubuntu, is Ubuntu One integration for purchasing music from Ubuntu's music store. Of course, there's nothing stopping you from buying music via Rhythmbox and managing it in another player, and all of these can be found in Ubuntu's repositories.

Happy listening! [EJC](#)

Getting fit with your iPhone

Shed those extra layers of fat without stepping foot inside a gym.

APC EXPERT

JENNETH ORANTIA

Jenneth Orantia has been writing and obsessing about mobile technology for nearly a decade. Her first i-device was a Compaq iPAQ, and counts jailbreaking and installing custom ROMs as two of her favourite hobbies.

We get it: you put on a few kilos over winter. It happens to the best of us. But with warmer weather fast approaching, you won't have that bulky jacket and long trousers to hide behind for much longer.

If you can't afford a personal trainer or even a gym membership, you can do it on the cheap with your iPhone, some apps and a few optional accessories.

GET WALKING

Walking 10,000 steps a day is a good goal to strive for when you're starting out. It's just you and your walking shoes, and possibly a peppy playlist on your iPod or iPhone to keep you motivated.

10,000 steps is the equivalent of approximately 8km. This may seem daunting at first, but you don't have to do it all in one go. In fact, you've got the entire day to do it and this includes walking around your home and walking back and forth from your desk at work.

The trick is keeping track of all of the steps you make in a day, which is where a pedometer app comes in handy. Pedometer Step Counter is a free app that records all of your steps using the iPhone's built-in accelerometer. If you keep your iPhone in your pocket and remember to start a new session every time you walk, it should give you a fairly accurate count.

However, if you're not good about remembering to start a new session whenever you go walking – or find it a hassle, as the app needs to be in the foreground to work properly – a dedicated pedometer is a better solution, as you can clip it onto your clothing at the start of the day and forget about it altogether. The Fitbit Ultra Wireless Activity + Sleep Tracker is one of the better pedometers on the market and counts all the steps you take in the day, with separate logs for stairs climbed, calories burned and distance travelled.

The Fitbit doesn't interface with your iPhone directly, although it wirelessly uploads data through your computer, and this data is then downloaded to your iPhone automatically whenever you open the free Fitbit Activity and Calorie Tracker iPhone app. You can also use this app to add extra information throughout the day, such as exercise, food consumption information and weight losses or gains.

GET RUNNING

Jogging or running is easier to monitor with an iPhone app, as there are specific start and end times for each activity. If you've never attempted running before, the free 5K



The Fitbit Ultra Wireless Activity + Sleep Tracker is one of the better pedometers available.



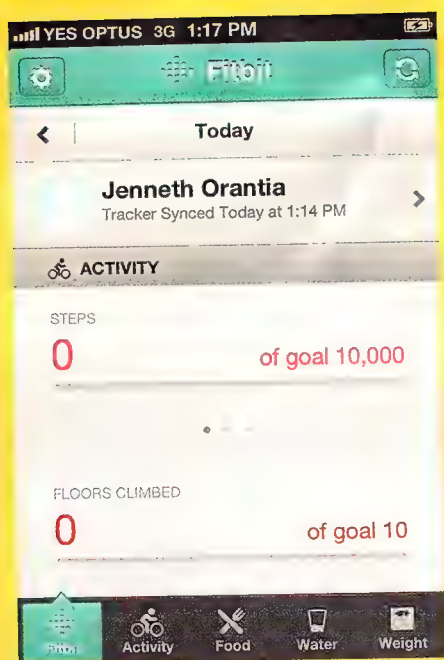
The Fitbit Aria Wi-Fi Smart Scale can log all your weigh-ins and upload them to web portals.

Runner app is worth its weight in gold. It's a structured program that builds up your running stamina over an eight-week period, starting off easy and then gradually increasing the intensity.

If you can commit to 25-35 minutes three times a week, you'll be running 5km like a pro by the end of the eighth week.

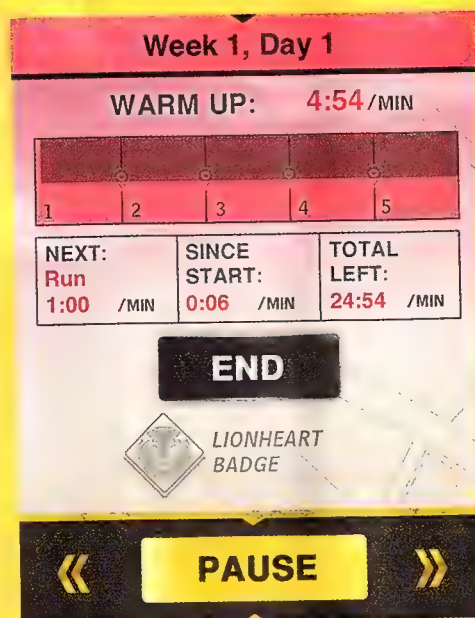
If you're happy with your existing pace, the free RunKeeper app offers a rich set of tools for logging your runs. By default, it gives you verbal feedback every five minutes to tell you what your average pace is and how far you've travelled, and you can adjust these audio cues in the settings to add more or less information or change the time intervals. There's also a 'personal trainer' feature that can coach you to reach a particular pace, distance or duration, and you can load music playlists from within the app so you don't have to go back and forth between apps.

The Wahoo Blue HR Heart Rate Strap makes a great companion to RunKeeper, as it lets you check whether you're



The Fitbit iPhone app imports data from the Ultra Wireless Activity + Sleep Tracker.

The 5K Runner app is a program that builds up your running stamina over eight weeks.



The longest journey begins with a small step taken by a brave person



The free RunKeeper app offers a rich set of tools for logging your runs.

in your target heart rate zone while you're running. This is based on your age and if you want to lose weight, it's 70-90% of your maximum heart rate. But you don't need to work any of this out while you're running – once you pair the heart rate strap to your

iPhone over Bluetooth, RunKeeper will automatically start logging your heart rate along with the rest of your training stats and give you verbal feedback while you're running as to which heart rate zone you're in.

EAT BETTER

Any personal trainer will tell you that good nutrition is more important than exercise when it comes to losing weight, although the ideal is to have an equal measure of both.

Stuffing your face with greasy takeaway food and sugary snacks is easy when no-one is holding you accountable. However, if you have to keep track of all the food you eat, along with all of the kilojoules you consume with every mouthful, shovelling food into your gob becomes a lot less desirable.

MyFitnessPal is a free diet tracker app that lets you log all the food you eat. You tell it how

much you weigh and how much you'd like to weigh, and it tells you how much you can eat every day to keep within your goal. The app has a huge food database, so you can easily find the nutritional information of all the food you eat. It also works with Fitbit by importing calories you've expended walking and adjusting your daily calorie goal accordingly.

KEEP AN EYE ON YOUR WEIGHT

The final piece of the puzzle is keeping an eye on your progress. Taking a self-portrait before you begin your program is a good way to stay motivated, as you can then look back at 'the old you' in a few weeks, and then in a few months, to see improvements.

Jumping on the scales once a week is also a good way to track your progress, but it isn't the be-all and end-all; once you start losing fat and gaining muscle, total weight isn't as relevant. Measuring your waistline, hips and chest every two weeks is a better indication of progress, as is keeping an eye on your body fat percentage and BMI (body mass index).

Your iPhone can't help you with your measurements (a cheap tape measure will do), but if you want to weigh yourself the high-tech way, Wi-Fi-enabled scales like the Withings Wi-Fi Body Scale and Fitbit Aria Wi-Fi Smart Scale can log all your weigh-ins and automatically upload them to web portals. The Withings scale has a free WiScale app that you can use for checking your weight and other statistics, while the Fitbit scale's information can be viewed in the Fitbit iPhone app. **ETC**



The Wahoo Blue HR Heart Rate Strap checks whether you're in your target heart rate zone.



Turn your iPad into a desktop accessory

With the right apps, your iPad can moonlight as a second monitor and wireless trackpad for your computer.

APC EXPERT

JENNETH ORANTIA

Jenneth Orantia has been writing and obsessing about mobile technology for nearly a decade. Her first i-device was a Compaq iPAQ, and counts jailbreaking and installing custom ROMs as two of her favourite hobbies.

The Air Display app turns your iPad into a second monitor for your Windows or Mac computer.

Most of the tutorials about the iPad focus on how much it lets you do independently of a desktop or laptop computer. This isn't one of those articles. For this tutorial, we're going to focus on ways the iPad can actually enhance your old ball-and-chain of a desktop.

MAKE IT A SECOND MONITOR

The nifty Air Display app turns your iPad into a second monitor for your Windows or Mac computer. At \$10.49, it's pricey as far as apps go, but it's well worth the pocket change for the functionality it offers and it's universal, so you can use the same app on your iPod Touch and iPhone for free.

Once you install the Air Display Connect software (available for download from avatron.com/d) and follow the setup instructions, your iPad will behave exactly like a traditional second monitor by mirroring or extending your desktop, only it's connected to your computer over Wi-Fi instead of a wired cable.

You can drag any window over to your iPad, and it accepts input from both your computer mouse and keyboard and direct touch on the screen. This setup works well for transferring secondary windows to your iPad, such as Twitter, email, instant messaging, calendar, music or video.

Since it works over Wi-Fi, your iPad doesn't even need to be next to your computer to work as a second screen. You can work on a Word document or Excel spreadsheet on your computer and then drag it over to your iPad and continue



Mobile Mouse will transform your iPad into a huge Magic Trackpad/virtual keyboard.

working on the file from a different room. Air Display also supports video out, so you can even output the mirrored or extended display to your TV using a video cable or AirPlay.

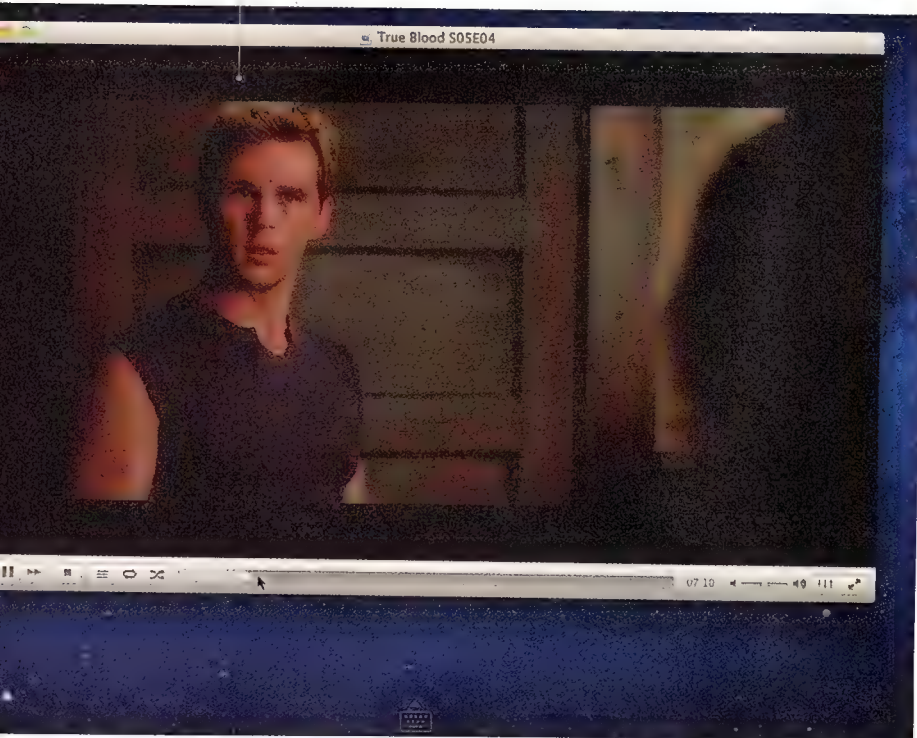
USE IT AS A WIRELESS KEYBOARD & MOUSE

Ever run out of batteries on your computer's wireless keyboard or mouse and been locked out of using your computer because you didn't have any batteries in the house to replace them? Mobile Mouse will save your bacon by transforming your iPad into a huge Magic Trackpad/virtual keyboard.

You'll need to download the server software to your Windows or Mac computer beforehand from www.mobilemouse.com. As well as offering a virtual trackpad and keyboard, Magic Mouse displays the application dock at the bottom of the screen (if you're using a Mac) to make it easier to switch apps. It also displays controls specific to the app you're using; for example, if you open iTunes or a video player, it will display media playback controls automatically; if you open a web browser, it'll automatically display browser controls such as back, forward, home and search.

You can also use Magic Mouse to perform the multitouch gestures that are supported by your operating system. The basic ones include zooming in and out of photos and scrolling.

Like Air Display, Magic Mouse works over Wi-Fi, which means you can control your computer beyond the standard 10m that Bluetooth supports. This is especially handy if you want to control music playback from another room, or you want to access video controls on your computer while you're sitting on the couch. **BTIC**



Port MIUI to your device

MIUI is gaining popularity. Find out how to get it on your unsupported device.

PC EXPERT

SIMON CHESTER

An Android enthusiast since the days of the Dream, Simon has watched the fledgling OS grow from curio to juggernaut, and has rooted, ROMed and tweaked more devices than is polite to speak of. Join him as he shows you how to make the most of that Android powerhouse in your pocket.

MIUI (me, you, I) is fast becoming one of the most popular custom Android ROMs. It's a functional, fun and good-looking (at least some of the themes are) alternative to other Android ROMs.

However, the number of devices supported by the MIUI team is dwarfed by the number supported by the old favourite, CyanogenMod. So if you were keen to install MIUI, you may have already been paid a visit by the disappointment fairy.

But don't let that get you down, buddy. If your phone is supported by CyanogenMod 9 (CM9) or any other Android Open Source Project (AOSP) Ice Cream Sandwich (ICS) ROM, then MIUI is but a wave of your magic mouse away (incantations optional).

First things first: you need to download a copy of a CM9 or an AOSP ROM designed either for your phone or for a phone by the same manufacturer as yours, preferably with the same screen resolution. Go get one from get.cm.

Once downloaded, extract the files to a directory called CM9. Most of the work you do will be on these files and ultimately, it's a modified version of this CM9 ROM that will end up on your device.

Obviously, you also need a MIUI ROM, so go grab a copy of that from en.miui.com/download.html and extract the files to a directory called MIUI.

Copy the folders MIUI/system/app and MIUI/system/framework, and paste them into the equivalent directory in the CM9 ROM. You also need to copy MIUI/system/lib/libandroid_runtime.so into CM9. Your phone won't boot without this file, but if you get a boot loop when you finally run your new ROM, you should try using the 'libandroid_runtime.so' that came with CM9.

Delete the CM9/system/media folder and replace it with the one from MIUI. This is so that all the MIUI themes, wallpapers and audio will work. Copy 'telocation.db' and 'yellowpage.db' from MIUI/system/etc into CM9. Also do this

for 'content-types.properties' in MIUI/system/lib.

For the MIUI backup and themes apps to work, you need to copy the 'invoke-as' file from MIUI/system/xbin to CM9 and give it the correct permissions in the 'updater-script'. Before you change the permissions, though, copy 'liblbesec.so' from MIUI/system/lib to CM9, so that the Super User app will work.

To set the correct updater permissions, open CM9\META-INF\com\google\android\updater-script in Notepad++ (or your preferred Unix-friendly text editor) and at the bottom of the list of set_perm, add these lines

```
set_perm(0, 0, 06755, "/system/xbin/invoke-as");
set_perm(0, 0, 0755, "/system/lib/liblbesec.so");
```

Next you need to open up CM9/system/build.prop in Notepad++ and edit the following lines:

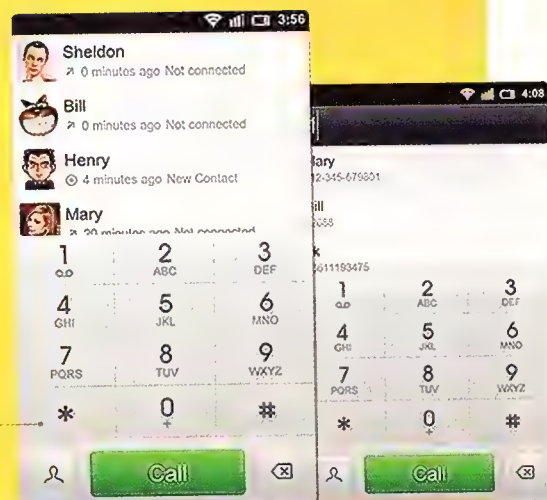
```
ro.build.id=MIUI
ro.build.display.id=MIUI
ro.build.version.incremental=2.X.X (enter the version
number of MIUI that you downloaded)
ro.config.ringtone=MI.ogg
ro.config.notification_sound=FadeIn.ogg
ro.config.alarm_alert=GoodMorning.ogg
ro.config.sms_received_sound=FadeIn.ogg
ro.config.sms_delivered_sound=MessageComplete.ogg
```

And that's pretty much it! If you like, you can add in any updated apps and wallpapers, then all you have to do is zip the folders in your CM9 directory (don't compress them, just zip - I use 7-Zip) and install it via ClockworkMod. Bear in mind that if your base ROM (in this case, CM9) has bugs, they'll carry over to MIUI. You may also lose your APNs (and thus data) in the process, so go and create them for your telco (a list is available at ausdroid.net/apns). **ADIC**



MIUI is fast becoming one of the most popular custom Android ROMs.

MIUI's dialler is one of its most popular features.



Type better on a tablet

Typing on touchscreens is bad enough; typing on tablets is even worse. Let's fix that.

APC EXPERT

SIMON CHESTER

An Android enthusiast since the days of the Dream, Simon has watched the fledgling OS grow from curio to juggernaut, and has rooted, ROMed and tweaked more devices than is polite to speak of. Join him as he shows you how to make the most of that Android powerhouse in your pocket.

Typing on a tablet is still a lesson in frustration, usually because you're trying to juggle the 10in screen with one hand, while pecking across the letters with the other.

There are a lot of different ideas out there on how to make the experience a little better, so thankfully, on Android, you can easily swap the default keyboard for another. Ranging from the novel to the creepily predictive, there's a keyboard out there with your name on it (OK, yes, every keyboard has your name *somewhere* on it).

THE SPLIT STYLE

One way of dealing with the extra stretch required for typing on a 10in screen is to split the keyboard into two tiny keyboards, each located to one side of the screen, and each within perfect reach of your two thumbs. There are a few different keyboards offering this as an option, but my fave of the bunch is Thumb Keyboard (\$2.34).

Thumb Keyboard gives you a choice of layout options, suitable for different devices (phones, 7in tablets, 10in tablets) and within those layouts, a choice of keyboard types. It wins in my book because the split keyboard contains amount of extra buttons in the centre keyboard, including arrow keys and dedicated, customisable shortcut buttons. On top of this is the ability to customise the keyboard's size and layout, as well as choose from nearly 30 skins, or a custom background.

In addition to the split keyboard, however, you can also switch to a condensed keyboard that sits to the very right-hand side of the screen, giving you a nice, big, blank non-touch-responsive area on the left, in which to place your thumb for extra support when holding your tablet. Good thinking, 99.

BETTER PREDICTIONS

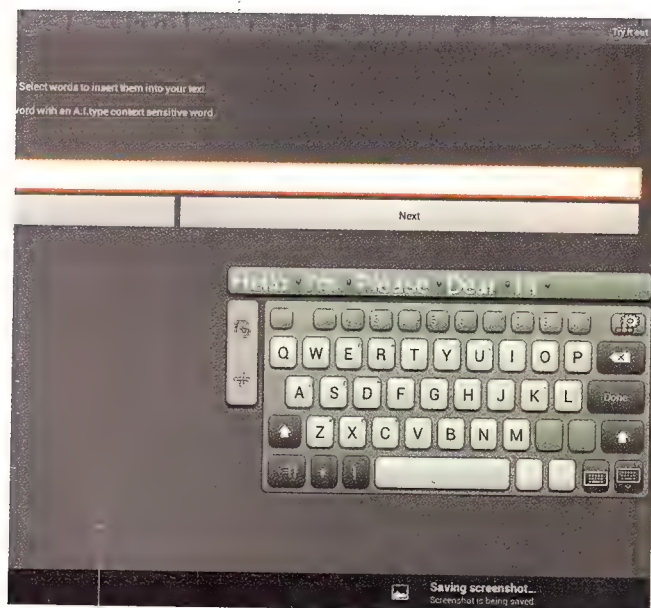
My new fave keyboard for Android handsets, Swiftkey 3, has legendary predictive text capabilities. You can get it to scan your email, Facebook, Twitter and blog feeds, updating its dictionary and predictive text capabilities to reflect your writing style. Swiftkey 3 also comes in a tablet-optimised version (\$3.99, available separately to the standard handset version). The tablet optimisation is a split keyboard, similar to Thumb Keyboard, only with a few less buttons in the centre part. The superior predictive text helps make up for this, though, as the predictive text on Thumb Keyboard is definitely lacking.

THE LOOKER

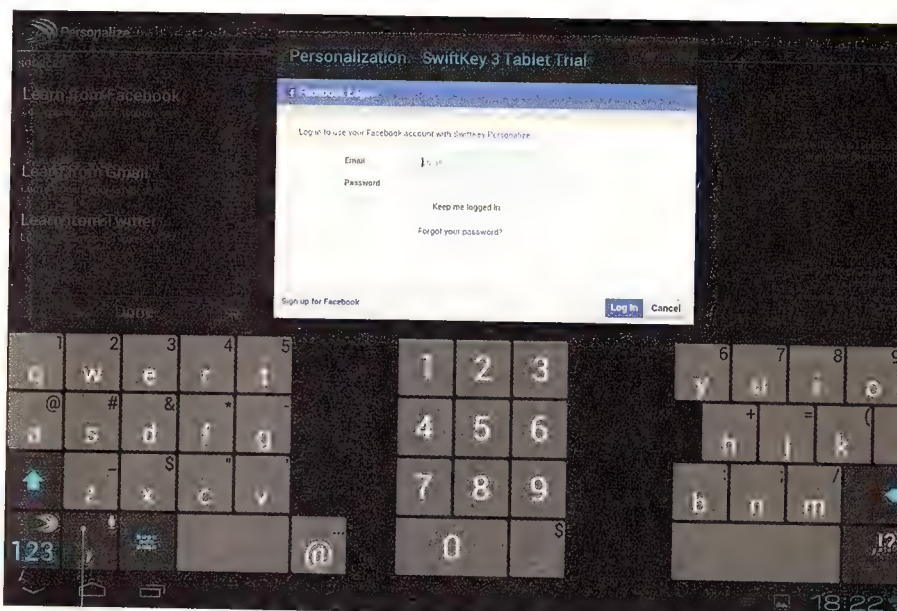
Looking for something a little more aesthetically appealing? FloatNSplit Keyboard has the same split-style, but with a skinnable interface. It also has the added bonus of floating above the text (rather than pushing the window up), much like the iPad's split keyboard. There are pros and cons here, of course: the pro being the fact that you can have independent heights for each of your typing hands, the con being that sometimes the keyboard gets in the way of a screen element.

There are five skins included, each one ripping off another mobile OS, but there's also a link to Google Play, where you would expect some more to exist. However, there were only two – rather sub-par – themes listed. Hopefully more will come in the future, but honestly, I like the included A.I. type theme enough, anyway.

The biggest benefit of this keyboard is that it's free if you don't want predictive text, and only \$1.94 if you do. **APC**



Don't like where your keyboard sits? FloatNSplit lets you move it.



Swiftkey 3 has some of the best predictive text around.

WINDOWS

Master your PC with gestures

Mark Wilson explains how to control your PC with minimal effort using StrokesPlus.

YOU'LL NEED THIS

STROKESPLUS

Download this free application from www.strokesplus.com. It interprets mouse gestures and translates them into actions on the screen.

When you control your computer, you usually work with a mouse and keyboard, although touchscreens are now becoming more common input devices, too. Ordinarily, a mouse is used to perform a limited number of actions within a GUI, such as clicking on icons and selecting menu options. StrokesPlus is an innovative free tool that enables you to draw gestures with your mouse

and use these as triggers for a huge range of different actions. For example, you could configure the program to launch Internet Explorer when you draw an E with your mouse. The possibilities are endless.

We recently discovered this great little freeware program, and it didn't take us long to fall in love with it. We particularly like the fact that you can

make things as simple or as complicated as you like.

You can use StrokesPlus as a straightforward program launcher, but it can also be used as a great time-saving tool to trigger a number of different actions with a single gesture. StrokesPlus even allows you to use modifier keys like Ctrl and Alt to avoid activating gestures accidentally.

GET TO KNOW STROKESPLUS

GESTURES

The shape you need to draw with your mouse to trigger an action that's been configured is known as a gesture.

ACTIONS

StrokesPlus includes a number of predefined actions that can be used to control different aspects of Windows without the need for configuration.

APPS

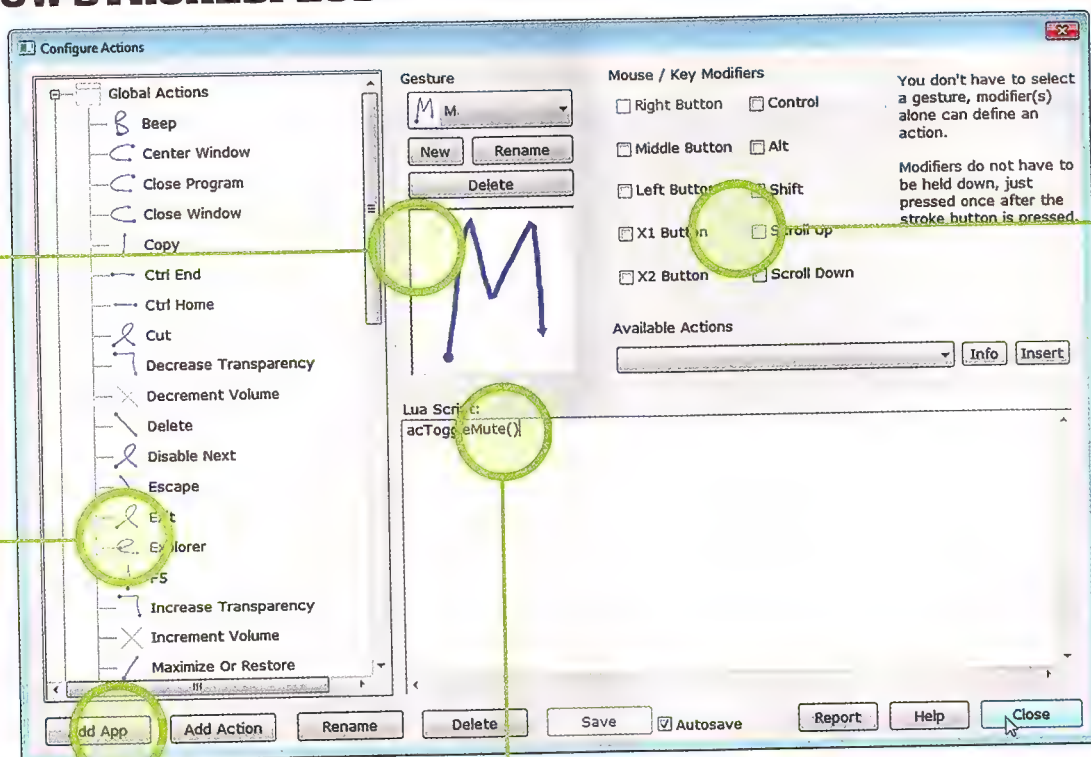
It's possible to create gestures that only work with specific apps, and these can be configured here.

SCRIPT

The actions performed by gestures are controlled by a language called Lua Script, but you can use it without learning to program.

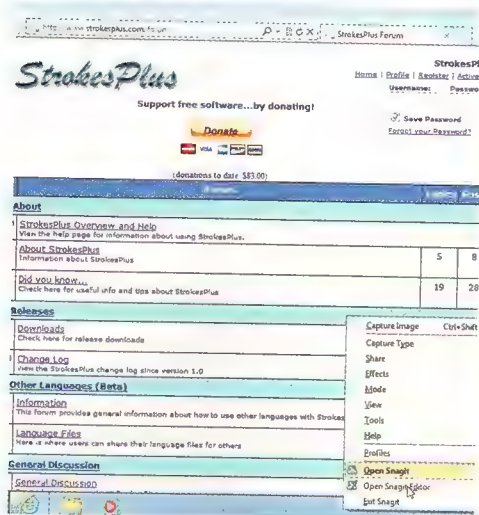
MODIFIERS

Different actions can be triggered by drawing the same gesture with different keys held down. These are known as modifiers.



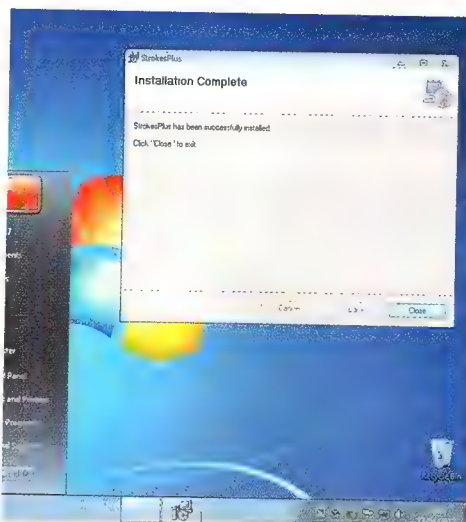
CONTROL YOUR PC BY DRAWING

Create your own gestures to speed up everyday computing tasks.



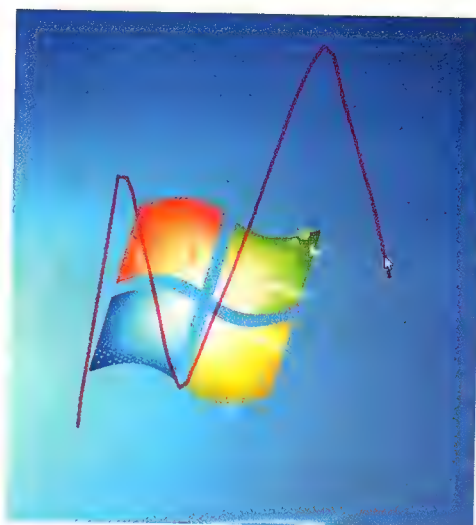
01 DOWNLOAD STOKESPLUS

Open your web browser of choice and go to www.strokesplus.com. You can download the latest version of the software by clicking the 'Forum' link and selecting the 'Downloads' forum. Click the link that relates to the most recent version of the program and then 'Set up package download' for the 32- or 64-bit version of StrokesPlus.



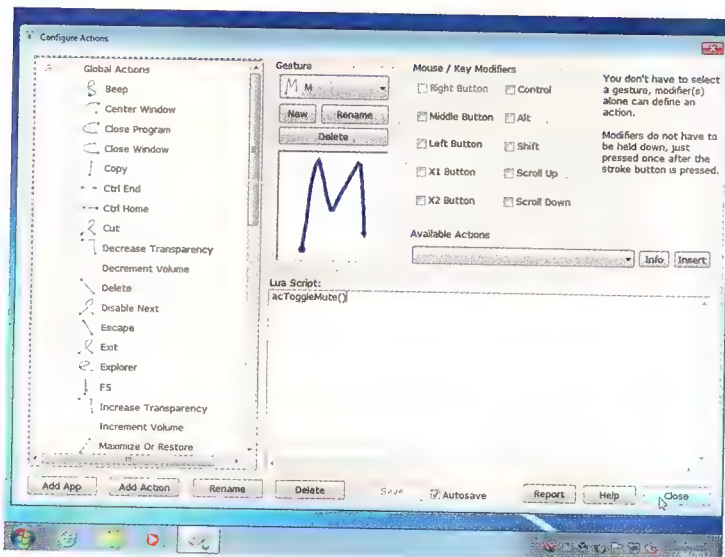
02 INSTALL THE PROGRAM

Double-click the .MSI file that's been downloaded and then click 'Next' followed by 'Next' again. Click 'Next' once more and then click 'Yes' if a User Account Control warning is displayed. Wait for the installation to complete and click 'Close' before launching StrokesPlus from the 'Start' menu. You may need to click 'Yes' to allow the program to run.



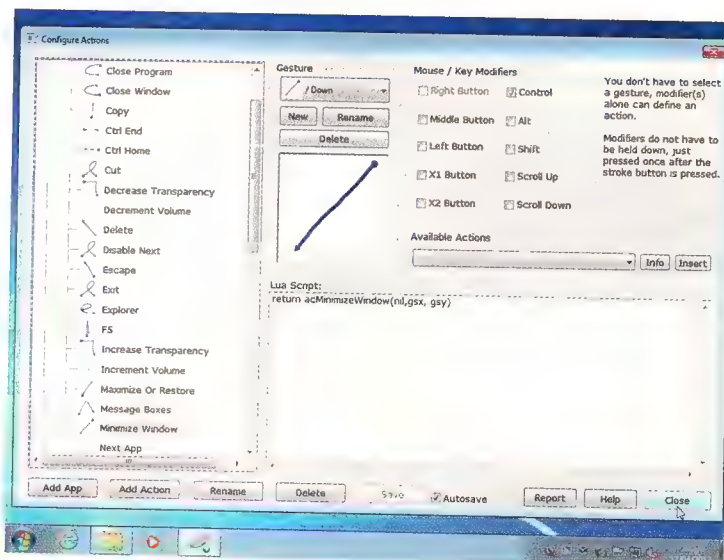
03 GESTURE TESTING

StrokesPlus features a few readymade gestures that will give you an idea of what it can do and allow you to check that it's functioning correctly. Hold the right mouse button and trace the shape of the letter M on the screen. When you release the mouse button, you should notice that your PC's sound has been muted. Repeat the gesture to unmute.



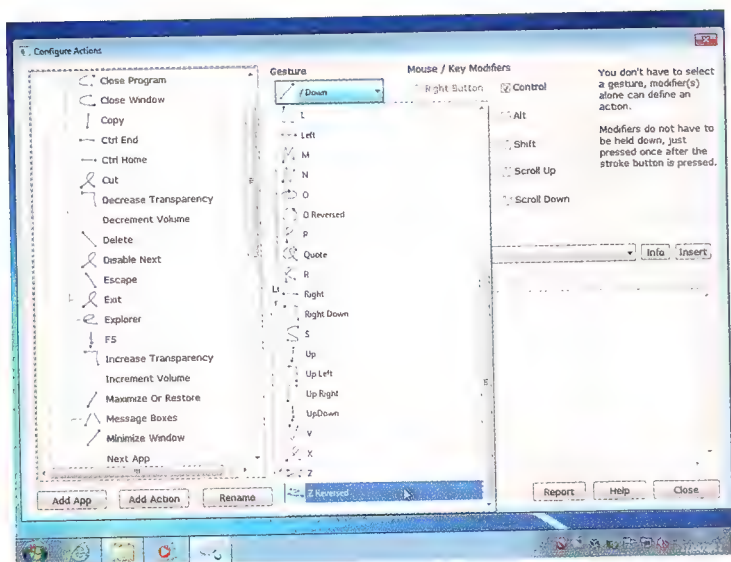
04 VIEW EXISTING GESTURES

We've mentioned that there are various built-in gestures you can start using right away. To see a list of these, right-click the StrokesPlus icon in the notification area of the taskbar and select the 'Actions' option from the menu that appears. You'll see a fairly lengthy list of predefined gestures to the left-hand side of the screen.



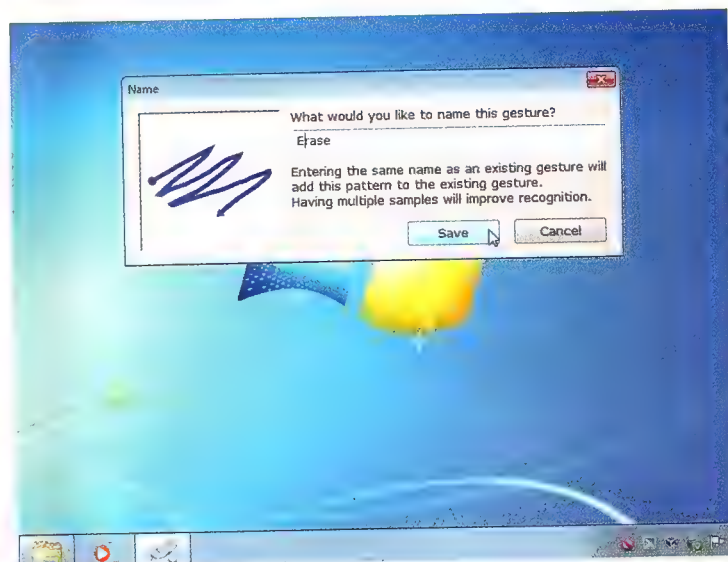
05 CHANGING MODIFIERS

If you click one of the actions that are listed to the left, such as 'Minimize window', you'll see a preview of the gesture that triggers it to the right. If you feel that this is a gesture you might perform by accident, you can tick the boxes next to modifier keys like Ctrl, Alt and Shift so the gesture will only be recognised when these keys are pressed.



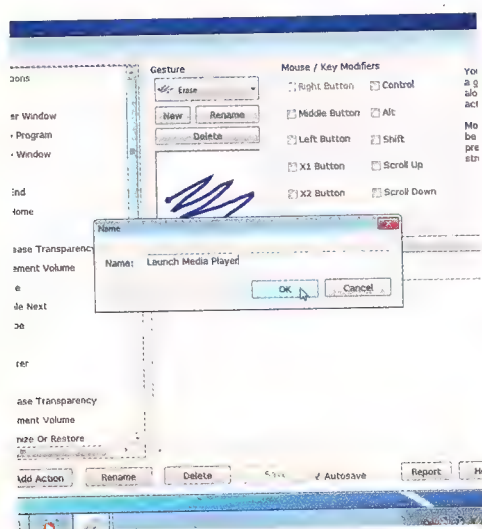
06 SELECTING NEW GESTURES

If you don't like the look of a particular gesture, you can choose from one of the others that have already been defined. Select an action from the list on the left and then open the 'Gesture' menu in the centre of the window before choosing the gesture shape you'd like to use. A gesture can be used for any action, but only one at a time.



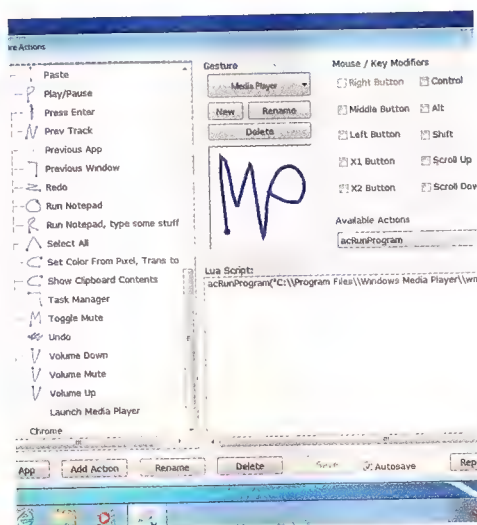
07 CREATING GESTURES

You can also create your own gesture shapes if you don't like the one that's already assigned to an action. Click the 'New' button followed by 'OK', and then use the right mouse button to draw the new gesture you'd like to create. Enter a suitable name for the custom gesture and click the 'Save' button to return to the main window.



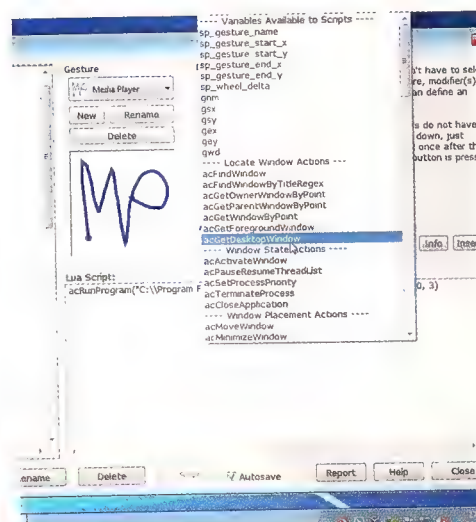
08 CREATING AN ACTION

You can create an action to make it easy to launch an application like Windows Media Player. Click the 'Add action' button and enter a suitable name before clicking 'OK'. Then use the 'Gesture' section to create a new gesture or select an existing one. You can also specify any keyboard modifiers that you'd like to use by ticking the relevant boxes.



09 DEFINE THE ACTION

Select 'acRunProgram' from the 'Available Actions' in the 'Utility Actions' section and then click 'Insert'. In the 'Lua Script' section, replace fullpath with C:\Program Files\Windows Media Player\wmplayer.exe, parameters with "", seconds with 0 and style with 3 as shown above. Then click 'Close'.



10 GET CREATIVE

StrokesPlus is an incredibly versatile tool and there's almost no limit to what it could be used for. There are lots of actions that you may want to use and these can be adapted to suit your needs. But the fact that you can also create your own means the program can be tailored to work however you want it to.

Deep scan your PC

Jon Thompson shows you how to discover hidden rootkits using BitDefender's RescueDisk.

YOU'LL NEED THIS

BITDEFENDER RESCUE DISK

This free bootable anti-rootkit software is available from tinyurl.com/66du4b.

GMER

Visit www.gmer.net to grab this Windows-based rootkit hunter.

Once upon a time, viruses were about chaos, destruction and loss of data, but that was before criminal gangs realised that computers could be used to extort and defraud, and could even be used as cyber weapons. For the past decade or so, online crime has continued to evolve faster than the industry that has sprung up to protect us from it.

Malware of all kinds is becoming stealthier as the rewards become more lucrative, and today even the most basic botnet client can cover itself in a shroud of invisibility. So how do you detect such an infection and give your network a clean bill of health? This requires deep scanning – far deeper than your normal antivirus software can provide.

ROOTING AROUND

The name 'rootkit' derives from 'root', which is the system administrator's account name on Unix and Linux-based operating systems, and 'kit', simply meaning a toolkit. Therefore, a rootkit is a toolkit designed to give privileged access to a computer.

To understand rootkits properly, it's necessary to see an operating system as a series of concentric security rings. At the centre is the kernel; this is usually called ring zero, and has the highest level of privilege over the operating system and the information it processes. Ring zero is also often referred to as kernel mode. Rings one and two are usually reserved for less privileged processes. If these rings fail, they will only affect any ring three processes that rely on them.

Ring three is where user processes reside and is usually referred to as user mode. Ring three is always subject to a strict hierarchy of privileges. It's interesting to note, however, that debuggers usually run in ring two because they need to pause and inspect the state of user mode processes.

Importantly, a process running in a higher-privileged ring is able to lower its privileges and run in an outer ring, but this can't work the other way around without the explicit consent of the operating system's security mechanisms.

LEGITIMATE ROOTKITS?

The non-malicious uses of rootkit technology are controversial to say the least. Some sting operations on organised crime syndicates have been known to use rootkits to gather evidence, for example. Rootkits have also been used in spying. In 2004, a rootkit was found in an Ericsson AXE telephone exchange belonging to Vodafone Greece. This enabled calls to be intercepted and was targeted at members of the Greek government and other officials. No-one knows who put it there.

More controversial than this, however, is the use of rootkits for digital rights management and to stop cheating in online games. In 2005, Sony BMG published CDs including copy protection and rights management software called Extended Copy Protection. The problem was that each CD's self-contained music player silently installed this as a rootkit, thereby limiting access to the CD whether or not the player was used. Microsoft's Mark Russinovich exposed

This is known as the principle of least privilege. In cases where such security mechanisms can be avoided, a privilege escalation vulnerability is said to exist.

Ring zero (kernel mode) processes, along with the modules that make them up, are responsible for managing the system's resources, CPU, I/O and modules such as low-level device drivers. Many rootkits are therefore designed to resemble device drivers or other kernel modules. If you want to spy on a computer, or intercept and modify data that doesn't belong to you, the kernel is the place to be. If you want to see everything that's typed into a keyboard, a rootkit that masquerades as the keyboard driver is what you need. To see everything sent to and from the network, a network card driver is the thing to replace.

PROTECTION

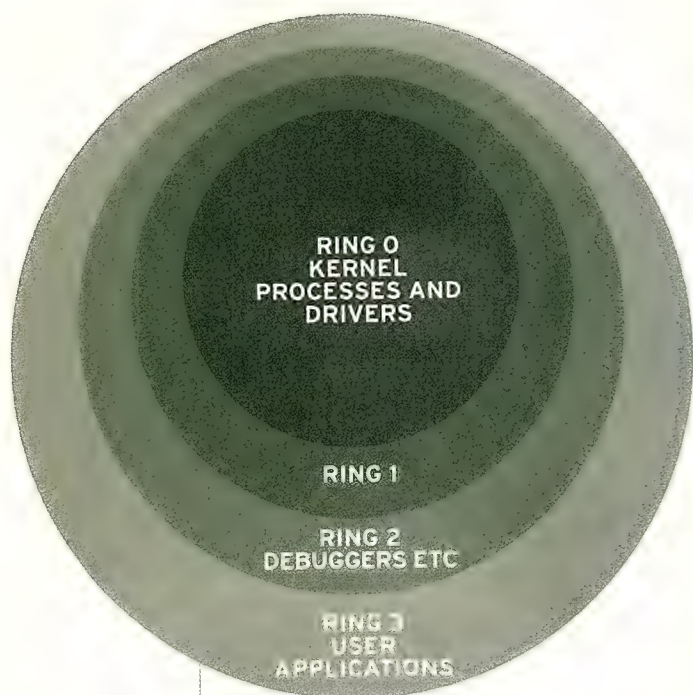
If kernels were simply lumps of code that were compiled by the developer and then never changed until another was



Some online games, such as *Cabal Online*, use a type of rootkit to prevent players cheating.

the practice and in the ensuing scandal, Sony was forced to issue a toolkit to remove the software. However, this left users open to a serious vulnerability, which was quickly exploited.

More recently, rootkits have been used to prevent cheating in massively multiplayer online role-playing games (MMORPGs). One such rootkit is Game Guard by INCA Internet Co. This hides the game's application process, monitors the entire virtual memory space for cheat processes, kills any processes that it determines are cheats, blocks calls to specified DirectX and Windows functions, and perhaps most invasively, logs every key press. It also silently updates itself.



In order to understand rootkits, you need to visualise the operating system as a set of concentric security rings, with the kernel at the centre.

released, rootkits would be easier to detect. However, modern operating systems are extensible; they can take advantage of optionally loadable modules. At system bootup, a typical operating system might scan the hardware and only load the modules it needs in order to control that hardware. These modules are therefore very lucrative targets for malicious code writers. If a module can be replaced with one containing a rootkit, it will then be loaded into the kernel and will run in ring zero.

To prevent poisoned kernel code from being loaded in 64-bit Windows 7, Microsoft now insists on cryptographic code signing for all loadable modules. A 'hash value' is generated for the module by running its code through an algorithm. Only if the code produces the same hash value as the original code compiled by Microsoft is it loaded and run. Any deviation from the hash value means that the code must have been modified and therefore will not load. However, because some older hardware still uses device drivers that don't support signing (as does some custom hardware), it is possible to bypass device driver signing by pressing F8 at boot time and selecting the option on the boot menu to disable it.

When installing programs in Windows, the User Access Control prompt that appears is also a potential infection vector. Once you say 'Yes', you're giving privileged access to the operating system – but do you always know what you're installing? If a hacker can convince you to click 'Yes' when you should be saying 'No', your antivirus software can't always save you. This is why it's dangerous to simply install software because a friend sends it to you, and why installing cracked, pirated versions of software can be extremely dangerous.

FLEXIBLE MALWARE

Today, rootkits are an epidemic. As malware, their purpose is not usually directly malicious, but instead they are used to hide malicious code from your operating system and your defences.

MICROKERNELS

What's the difference between a kernel and a microkernel? Put simply, the latter attempts to minimise the amount of code that's running in kernel mode. This is partly for overall system efficiency, but also for security. The less code there is running in the kernel, the fewer places there are for rootkits to hide.

OTHER TYPES OF ROOTKIT

Since the first proof-of-concept rootkit, the genre has taken on a life of its own as hackers have found new uses for them.

The kernel isn't the only thing of interest to rootkit writers. The boot sector of a hard disk is an optimum piece of code to infect. This is particularly useful in cases where full disk encryption is used, as malicious code can sniff the password used to decrypt the disk for use.

Even more useful are rootkits that sit in the firmware on disk and network controller cards. If a rootkit can reside here, protecting itself from detection, it can see all the data streaming to and from the disk and network.

Virtual machines are now common and give protection from a wide range of malware because their state can easily be rolled back should an infection occur. However, the hypervisors that make virtualisation possible can also become infected by rootkits.

Using on-chip virtualisation technologies, researchers have found ways to literally watch everything that goes on inside a virtual machine. One such rootkit is the Blue Pill, by Polish researcher Joanna Rutkowska. This is capable of 'lying' to the OS in a virtual machine and can fake hardware interrupts and even the system time to prevent detection.

Security researcher Joanna Rutkowska is a leading authority on virtualisation rootkits.



Being so flexible, rootkits find many uses. For example, rootkits can be used to create and open back doors to operating systems for privileged access, either by command line or via a GUI. Such access allows a potential attacker to browse, steal and modify information at will by subverting and even bypassing existing account authorisation mechanisms. If a rootkit stays on a PC after reboot, it will also allow hackers back into that system with privileged access at a later date.

To prevent discovery, once running, rootkits can also actively cloak their presence. How they do this is quite ingenious. Programs such as the Windows Task Manager or Microsoft's alternative Process Explorer (tinyurl.com/35y8jkj) both need

access to the operating system to report on what's happening. They are user processes, running in ring three with no direct access to the kernel's activities. Instead, they request information via authorised function calls. However, if a rootkit has replaced the part of the kernel servicing those calls, it can return all the information the system monitor wants – except for anything relating to the rootkit. Antivirus programs also use standard system calls, and this is why they are very poor at detecting rootkits on a running system.

This ability to operate invisibly within the operating system means that a major use of rootkits is to conceal other malware, which might in turn run in the outer rings of operating systems. Some rootkits can even disable antivirus software. It's not unusual to find a highly sophisticated rootkit protecting a fairly simple piece of malware. So how can they be discovered?

DETECTION TIME

Because a rootkit can actively defend against detection on a running operating system, the only way to be sure that it's not doing so is to prevent it from running. The best way to do this is to shut down the operating system itself and examine the disk upon which it is installed. While this is specialised work, many antivirus vendors have woken up

to the need for such tools and now supply them free of charge. We're going to use BitDefender's free RescueDisk, which is supplied as a bootable ISO image ready to be burned onto a bootable DVD. Based on Linux, this boots in place of the computer's operating system and scans the hard disk without any rootkit activity getting in the way.

You can download BitDefender's RescueDisk from tinyurl.com/66du4b. Click the 'BitDefenderRescueCD_v2.0.0_5_10_2010.iso' file to download it and then burn to a DVD. Once this is done, place the DVD in the drive and reboot the computer. After a few seconds, the BitDefender boot menu will appear. Press Enter and after a few minutes, a graphical desktop will load. BitDefender's software runs automatically from here. Click 'Continue' to start and the software will download and install the latest updates. BitDefender will then set to work examining the disk.

The software will run for 15 minutes or more depending on the size of your disk. It scans not only the operating system files, but also the boot loader and other files, looking for signs of infection. Provided that any rootkits are listed in the downloaded definition files, this should identify any stealth malware it encounters, including the malware that the rootkit was shielding.

Note that as it runs, BitDefender will refer to the C: drive as /media/LocalDisk-0. This is a convention in Linux and refers to the fact that the software mounts the system disk as it would any other storage device. Once you have completed the scan and (hopefully) found nothing, you can switch the system off and on again, remove the disk and boot into Windows as per usual.

WITHIN WINDOWS

While it's harder to determine whether a running Windows system is infected with a rootkit, it can be done. One solution to this problem is the free utility GMER, which you can download from www.gmer.net. To do so, click 'Files' and then the 'Download EXE' button. This randomises the filename. In theory, any lurking rootkit might be ready to block the GMER executable, but if the filename is random, it will be harder for this to happen.

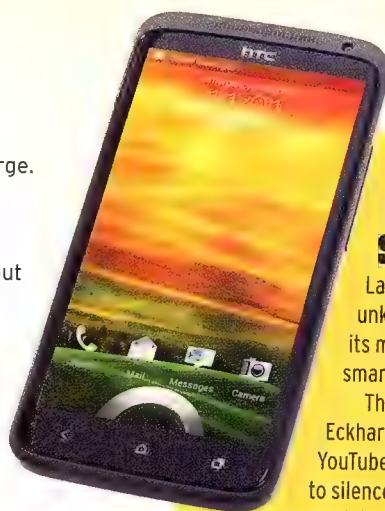
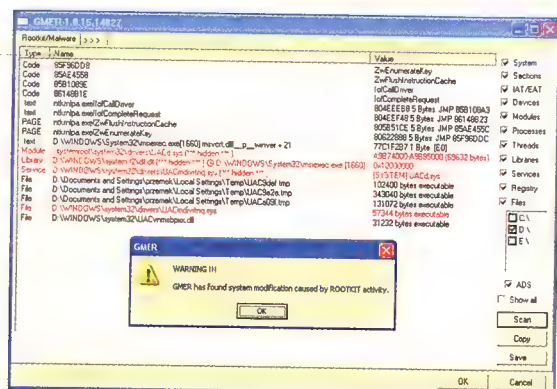
You'll then download a .ZIP file, which Windows Explorer should be able to open. Drag and drop the GMER.exe file to a convenient directory (a USB memory stick is a good option) and then double-click it to run it.

Click 'Scan' and GMER will scan the list of ticked operating system items in the right-hand column. This can take a while, but don't be concerned about the long list that appears unless you see something red, which indicates a possible infection.

As it scans, GMER also produces information about the running system. To see this information, click the tab marked '>>>'. This opens up several other tabs with the various types of information. Perhaps the most useful of these is the 'Processes' tab.

As with other forms of malware, the success of rootkit detection depends on the technology used and the definitions provided by the security vendor, but this isn't always 100% effective. It's therefore highly recommended that you scan your system using the free rescue disks provided by more than one vendor, as a mix of technologies and scanning methods is much more likely to detect rootkits. **BTIC**

GMER is a Windows tool for removing rootkits.



REMOVE CARRIER IQ FROM YOUR SMARTPHONE

Late last year came the revelation that a hitherto unknown Silicon Valley company called Carrier IQ had its monitoring software installed on over 150 million smartphones and other devices worldwide.

The issue blew up after security researcher Trevor Eckhart revealed the extent of the data being collected in a YouTube video (tinyurl.com/btedosp). Carrier IQ first tried to silence Eckhart with a cease and desist letter, then as the scandal broke, admitted that it encrypts and sends information to carriers to "enhance the user experience". However, the fact that the software collects so much information, and that it happens by default and without the user's knowledge or consent, remains.

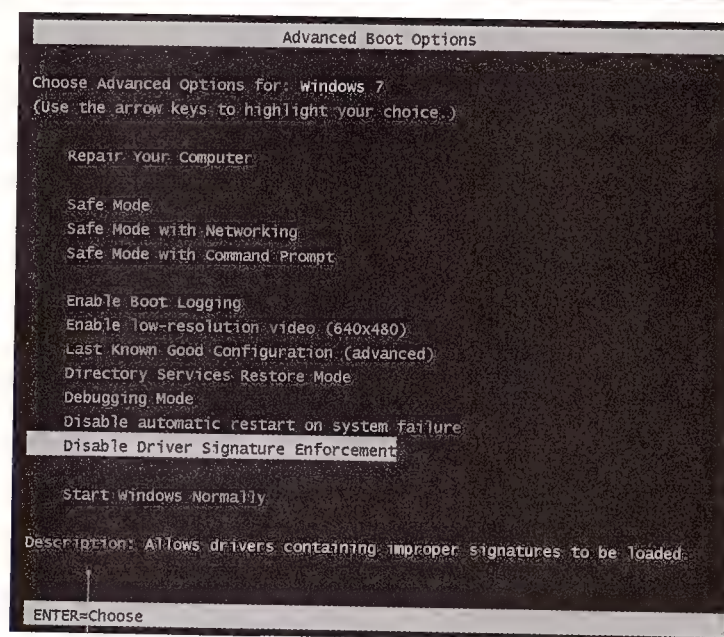
Apple says that most iOS 5 devices don't use Carrier IQ, but iPhone 4 users can disable it by going into 'Settings > General > About > Diagnostics and Usage'. Select 'Don't send'.

Android users can flash their ROM to a custom version of the operating system without Carrier IQ. Alternatively, Trevor Eckhart has released a purpose-built app (available from www.androidsecuritytest.com), which will remove the monitoring software.

On a BlackBerry device, removal depends on the OS version. For OS 6.0 and later, go to 'Options > Device > Application management' and find the IQ Agent. For OS 5.0, access 'Options > Applications' and select 'Third party'. For OS 4.1 to 4.7, go to 'Advanced Options > Applications' and finally, for OS 4.0, go to 'Applications' and find 'IQ Agent'. In all cases, press the 'Menu' button and select 'Delete'. Once this is done, restart the phone.

EARLY ROOTKITS

The first recorded occurrence of malicious code actively concealing its presence on a computer system was in 1986, with the Brain virus. This ran when the boot sector of a disk was loaded and run. However, before infection, it made a copy of the boot sector. If the disk controller attempted to load the real boot sector containing the Brain virus, the running code instead returned the uninfected copy of the boot sector.



Driver signature enforcement can still be turned off in Windows.

masterclass

STEP-BY-STEP TRAINING



PART 2

Working with media in HTML5

Rich media is one of the content types that is benefiting from the spread of HTML5. Here we explain how it's handled.

IN THIS SERIES

We explain exactly what HTML5 is, its benefits and how you can put it to work for you with hands-on tutorials and templates. This 8-part series is written by expert programmers led by Dr Rajesh Vasa, lecturer at Swinburne University of Technology.

APC EXPERT

DR RAJESH VASA

Dr Rajesh Vasa is a programming guru who lectures at Melbourne's Swinburne University of Technology. Along with several other experts, he'll take you through this masterclass on HTML5.

The last five years has seen an explosion of rich media and increasing use of maps to help locate and plan trips. Video in particular has increased in popularity due to the availability of decent broadband and sites like YouTube, which freely host and stream video. Maps are the other technology that took off, thanks to some ingenious Australian engineering, more widely known as Google Maps these days. Another Aussie technology, Wi-Fi, coupled with the rise of social media sites like Facebook and Twitter, has created completely new ways in which media is being created and consumed. The growth of smartphones added a completely new dimension – we now have photos and videos that are continuously geotagged and users have the ability to view layers on a map in near-real time.

When the world wide web and the original specification for HTML was created, the way we use video and mapping today was just a distant dream. Although we had video and the concept of mapping for well over two decades, the content creation and cost-effective distribution platforms were yet to be built and hence the HTML specification never really seriously catered for rich media in the core. Thankfully (or sadly, depending on your viewpoint), as the popularity of video grew, this gap was filled by embedded plug-ins like Adobe Flash and, to a lesser extent, Microsoft Silverlight technology.

The rise of YouTube essentially pushed Flash from a technology of animation to a video streaming powerhouse. While Flash video works and the modern versions are getting better, it has a few significant limitations. In particular, in order to view Flash videos the browsers need to load an external plug-in, which opens certain security concerns. Additionally, until recently Flash video was rendered using CPU, not the more appropriate GPU features available in almost all modern computer systems. Furthermore, Flash is a proprietary technology and offers increasingly sketchy support on Linux.

Flash video was alive and kicking quite a few goals until a little thing called the iPhone rocked the world with a notion that Flash technology and mobile aren't compatible. However, the Android platform showed it's possible to run Flash on mobile – the reality is Apple's decision essentially set up the scenario to end the near monopoly of Flash video. As the consumption landscape changed from desktops to mobile, TV and new tablets, Adobe has in effect thrown in the towel and indicated that it won't be releasing any further Flash releases for even the Android platform. The general argument against Flash on mobile is based on its inefficiency and original design approach, which causes Flash video playback to use battery power at an unhealthy pace. This

isn't really surprising since at the time Flash was conjured up, most people didn't consider mobile or efficiency as one of the key constraints to satisfy. So, how exactly does HTML5 fit into all of this?

Unlike Flash, HTML5 is a standard that grew over the last five years and hence it offers us specific tags to mark up video and audio. In effect, browsers can treat video as a first-class citizen and provide a built-in video rendering mechanism. In this article, we'll look at the support offered by HTML5 for video and audio. We'll also show you how best to take advantage of these features in the fragmented consumption device landscape that we now inhabit. We also have a brand-new HTML5 template designed by Neon Three that you can download (see page 116 for details) and customise for your own needs. The template is for a hypothetical cafe, but the design is flexible enough and can easily be adapted to suit your own needs.

VIDEO CONTAINERS & CODECS

Most modern browsers support HTML5 video. But before jumping into the semantics of the video and audio tags, it's helpful to go over the typical structure of a media file. A typical video file stores sound and images using special encoding algorithms that save space by eliminating certain content. For instance, removing frequencies of sounds that human ears can't pick up and not storing content that's similar across two frames in a video. The media player then uses a decoder to reverse the process and reconstructs the audio/video. These encode and decode algorithms are together called codecs. The key concept to note is that the quality of the media file depends on the codec used, as some algorithmic tricks are better than others; of course, the amount of detail that has been removed also has an impact.

Audio and video files each have their own specific file structures. Audio files are quite straightforward, since they store only sound and a little metadata to capture the name of song, artist name and so on. However, the structure of a video file is much more complex. Sadly, this also gives rise to a plethora of jargon associated with video files. For instance, we may have a video file that's advertised as an MP4 (H.264/AAC), but what exactly does this mean?

The most common view of a video file is an .AVI or a .MP4 file, since this is the popular distribution format. Strictly speaking, .AVI and .MP4 are container formats very similar to .ZIP files. That is, they contain different things such as the video track, multiple audio tracks, and potentially metadata like title, release date and other information about the video.

The audio track contains a set of markers to synchronise the audio with the video. The video container file stores video and audio tracks, either as interleaved chunks or as consecutive blocks to create a single file. Video files that have audio interleaved in small chunks (called atoms in the MPEG-4 standard) can be streamed after loading the first few seconds, as the video frames and the related audio are together. If video and audio are stored as consecutive chunks then we need to download (or buffer) the entire file before we can play back the video. Obviously for the web, the video file has to be created in a form that permits easy streaming.

When we watch a video (container) file, the video player first determines the container format and extracts the video/audio tracks via a process called demux. The extracted tracks are then decoded and the audio is synchronised with the video frames using the markers embedded in the audio track. The player finally renders the video and plays the audio by using appropriate hardware device drivers. The player also uses the metadata provided to display the title and may offer the user a chance to select the language of the audio track. In short, the video player pipeline is: demux, decode, sync and render.

Getting back to the jargon, what does MP4 (H.264/AAC) mean? MP4 is a container format (one of many), H.264 is the codec used to encode/decode the video track and AAC is the codec used for the audio track. Sadly, not all container formats are compatible with all codecs. Additionally, in the context of video playback in a browser, it depends on which codecs and container formats the browser offers built-in support for.

HTML5 initially started off by backing the open-source .OGG container format with Theora as the video codec and Vorbis as the audio codec. However, due to a lack of clarity around patents that protect most video codecs and potential conflicts that may arise, the standards group has essentially backed off and left that choice to the browser creators. Currently, all major browsers except for Firefox and Opera support MP4 with H.264 for video and both AAC and MP3 for audio. Recent statements from some core Firefox engineers suggests that they may be conceding defeat and moving to support the H.264 codec for video. Google announced about a year ago that it plans to drop support for H.264, but it seems to have forgotten about it either accidentally or intentionally. Furthermore, on mobile devices, thanks to Apple, H.264 has effectively won the battle. Even the Android-based smartphones are moving to or have moved the decode operation completely to hardware to reduce power consumption.

So what should we do if we want to stream video online? Currently, the best option is to



FIGURE 1

The video control panel changes between browsers.

use an .MP4 file container with H.264 for video encoding and AAC for audio – this should work well in most current-generation browsers and many recent smartphone browsers. For older devices, we'll sadly have to fall back to a Flash plug-in to display the video (we'll cover this later). First things first, let's have a look at the code for getting all of this magic to work.

VIDEO & AUDIO IN HTML5

The markup to embed video in HTML5 is simple. We use the `<video>` tag and point the source to the URL where the video file is stored. In the most basic case, we can specify automatic playback, continuous looping and buffering, and whether the browser should provide a control panel (see the code snippet below). Although browsers offer these features, the exact mechanism can change from one browser to another. For instance, the appearance of the control panel will change depending on the browser (see figure 1). We have the option to override this and provide our own behaviour via the API provided by the browser if we wish.

```
<video autoplay autobuffer loop controls
poster="logo.png">
<source src="video/neonthree.mp4"
type="video/mp4">
```

The video tag also allows us to display a poster, which is the image that's shown before the actual video commences. This is very useful to provide the users with some idea about the actual content before they click the Play button. As with the other embedded objects, we can specify the height and width of the video; however, if the underlying video is larger than the specified size, the browser may choose to render the video over other content in the page.

The `<audio>` tag is very similar to the `<video>` tag. We can start playback as soon as the page has loaded, we can specify looping. If we request controls, the browser will provide one. Just like in video, the API will allow us to override all of this behaviour via event triggers. To play sound, we need to use the `<audio>` tag and provide a source. Browsers typically offer good support for MP3, AAC and OGG (Vorbis) codecs.

DEALING WITH OLDER BROWSERS

HTML5 is a forward-looking standard and the current generation of browsers is starting to support the `<video>` tag, so we get support for playback right out of the box without any external plug-ins. However, the Flash video container, with its own proprietary video codec, is still a very popular video distribution format. Adobe now even supports the H.264 coded within the Flash container. Although Flash is effectively dead on mobile devices it's available on practically all desktop and laptops. This makes the use of the HTML5 `<video>` tag a little bit more complicated.

In the first part of this article (see APC August, page 112), we stated that we can trick the browser into accepting all of the new HTML5 tags as valid. Unfortunately, we can't make an old browser like IE7 actually play video, since that functionality isn't present natively in the browser. This means that for now, we need to rely on Flash technology to play back the videos that we want to embed as part of our web page.

The way to use Flash is reasonably simple. We provide an `<embed>` tag within the `<video>` tag, just like the `<source>` tag. This is very similar to how we embed a Flash plug-in or any other plug-in. If the browser supports HTML5 video, it will work with the source file you provided, otherwise it'll fall back to using the embedded plug-in. The only issue is that we need to ensure the Flash player actually supports the codec we used to create the source video file. Given the complications in dealing with older browsers, the best option is to make use of video playback libraries rather than build the code needed from scratch.

USING VIDEO PLAYBACK LIBRARIES

HTML5 video works reasonably well when users have a recent browser and/or the latest version of the Flash plug-in. But in today's tech landscape, this expectation isn't practical. Additionally, relying on the browser to display video implies that the video will end up looking

different on the diverse range of browsers that users will use. Although this may feel fine to an engineer, the designers will be horrified at this level of inconsistency. To be practical, we need a video display method that will work well across the majority of browsers, including on smartphones and tablets. We also need the ability to ensure that the video player looks consistent across different browsers.

HTML5 was designed to cope in a fragmented landscape – we can achieve a consistent look by making use of CSS to style the player and JavaScript to tap into the event triggers for the control panel. Of course, we can get down to first principles and build our own video player, but a safer option is to rely on one of the many video playback libraries available for HTML5 now. We have both commercial and open-source libraries that do this job. The commercial option is recommended if you need support, but the free and open-source versions are more than adequate for common use. One advantage of using these libraries is that they're continuously improved and tested across a range of browsers.

A typical HTML5 video library will allow us to use the `<video>` tag and will take care of the Flash fallback option if the browser doesn't have the native ability to play HTML5 video. We can even skin these players to fit within the design expectations of our web site. The best part is that we don't have to resort to CSS/JavaScript tricks, as the library makes it very simple to achieve our goals.

A reliable open-source option for HTML5 video playback is Video.js (www.videojs.com). This library is backed by Zencoder, a cloud-based video encoding service, and is CDN hosted, so you just have to provide a link to it. This library will offer consistent playback across all major browsers – it even deals with the various quirks between the browsers for you. It also works in IE and offers a lightweight Flash fallback. It provides support for subtitles, as well as full-screen mode if the browser supports it.

In order to use Video.js, you need to point it to the library script and point the CSS class of the `<video>` tag to use library-defined controls, as highlighted in the following code fragment (the link and script are in the header, while the video is in the body). This code will display a small clip that's hosted by Zencoder and will provide a control panel that's better than the typical one offered by most browsers. The library will show a large Play button on top of the poster (see figure 2) and a more comprehensive control panel during playback (see figure 3).

```
<link href="http://vjs.zencdn.net/c/
video-js.css" rel="stylesheet">
```



FIGURE 2

A poster image with a CSS-themed Play control.



FIGURE 3

The Video.js library control panel.

```
<script src="http://vjs.zencdn.net/c/
video.js">
```

```
<video id="vid" class="video-js vjs-default-
skin" width="640" height="264"
poster="http://video-js.zencoder.com/
oceans-clip.jpg" controls data-setup="{ }">
  <source src="http://video-js.zencoder.
com/oceans-clip.mp4" type="video/mp4"/>
  <source src="http://video-js.zencoder.
com/oceans-clip.webm" type="video/
webm"/>
</video>
```

The Video.js library is relatively new, but is gaining popularity. There are other alternatives available, such as SublimeVideo (sublimevideo.net). The SublimeVideo player is also hosted for you, but will show a watermark when you use the free version. The commercial version offers support and will remove the watermark. The one advantage of SublimeVideo is that it offers good analytics and reporting, which may be needed in some contexts.

Another video player in this space is JW Player (www.longtailvideo.com). This player is more widely known as an alternative player for Flash video, but it's recently started to offer support for HTML5 `<video>` tags in the markup. It has all the key features you need in a player and offers a really good Flash fallback option; unfortunately, the configuration is more complex than Video.js or SublimeVideo.

DEALING WITH THE FRAGMENTED LANDSCAPE

The gist of this article so far is that HTML5 browsers support video. All a web developer has to do is create a video in a format that's supported by the browser landscape. Sadly, video on the web is a little bit more complicated. In particular, we're now dealing with a very fragmented landscape with the use of tablets, smartphones, laptops and desktops of varying capabilities. Video also works well when we have them big pipes – as in it's very bandwidth-hungry. In other words, to make video work in practice, we need to show a smaller and potentially lower-quality file to a smartphone on a 3G connection, and present a 720p stream only to users with the appropriate bandwidth.

We can solve this adaptive streaming problem in a number of ways. One option is to encode the video and have it available in various formats and sizes, then use some JavaScript to determine the most appropriate file and then stream that. However, given the diversity and change in the browser landscape, a better option is to offload that to a service which can do this for us like Vid.ly.

Vid.ly is a service where you upload a video file and it will then deliver the most optimal video stream, based on the device and browser's capabilities. Unfortunately, to ensure backward compatibility with older browsers it uses an `<iframe>` rather than the `<video>` tag. We use this service in the

custom template offered as a part of this article, so have a quick look at the source code of the template's main page to see how to make use of this service.

So, where does a service like YouTube fit into the mix? YouTube allows developers to embed a video object and can be used to deliver video content. The player is quite efficient and deals with the range of devices and browsers. Additionally, Google allows users to specify whether they want YouTube to make use of the HTML5 capabilities of a browser at **youtube.com/html5**. The downside of YouTube and other similar services is they tend to work better for freely distributable content. If your video needs are more commercial, you'll need to consider a video streaming provider that offers commercial plans and appropriate support.

OBTAINING & CUSTOMISING THE TEMPLATE

The template offered as part of this article is designed by Neon Three to help create the web site for a cafe (see **figure 5**). We make use of HTML5 video right on the main page (see **figure 6**). You can customise the template with your own content and include links to appropriate social networks, show recent tweets as well as publish rich media. The source code is available on GitHub freely for you to download and use. To get the template, navigate to **github.com/neonthree/html5** and you can clone the repository or view the source files in a web browser. The source code is structured using a typical folder structure. The style sheets are in the 'css' folder, while the shared JavaScript files are all placed in the 'js' folder. The sub-pages in the site are all placed in the 'pages' folder.

The template is designed to allow easy modification. In particular, you can change the logo with your own custom one. All of the pages have predefined content for a hypothetical cafe. You can make the adjustment quite easily to suit your needs. The code is structured using the new semantic elements available in HTML5. In particular, we make extensive use of `<article>` and `<section>` tags. We also use the `<header>` and `<footer>` tags to encapsulate the design intent better.

The template we've provided is currently wired up to show a short video on the home page. The video is served from Vid.ly, so have a quick look at the source code to get an idea of how it can be embedded. The video is shown in a modal pop-up that dims the background. This effect is achieved by using jQuery with the FancyBox plug-in. The script code that performs this little trick is embedded at the bottom of the main page. [\[code\]](#)

FIGURE 6

The Vid.ly video player embedded in a dialogue box.

vid.ly
universal video url

HTML5 and mobile video solved

Sign Up or try one

Pricing | Blog | API | FAQ

Video transcoding, device detection, delivery, storage... All in a single url.

20+ formats | 1 source video
You give us one video and we create all the required formats to ensure your video will playback on every browser and device in the market. You don't need to worry about codes, bitrates, screen sizes... we take care of all the heavy lifting so you can focus on what you do best.

6,000 devices | Accurate device detection
There are currently thousands of smart phones, mobile devices, tablets and browsers with new ones being added each month. It's nearly impossible for you to keep up. Not anymore. We intelligently detect the device requesting your video, and deliver the optimized video.

HTML5 ready | Universal Embed code
Confused by HTML5 video? With the lack of cross-browser standards, everyone is. We have this solved. Publish our Universal Embed code and we'll take care of the rest. We'll even deliver a Flash version for older browsers.

```
<iframe frameborder="0" width="640" height="360" ...></iframe>
```

Trends in Internet & Mobile Video

Device	% of total views
iPhone	200%
iPad	20%
Android	11.1%
Blackberry	0%

FIGURE 4

Vid.ly offers a video streaming solution to deal with the fragmented landscape we live in.

MENU GALLERY ABOUT CONTACT

Some Cafe

We make good food.

100% vegetarian - providing the best direct support for the local and freshest quality foods!

WATCH OUR VIDEO!

Menu
Lorem ipsum dolor sit amet, consectetur adipiscing elit. Cras sem sem, accumsan sit amet rhoncus sed, pulvinar nec urna. Nunc vitae tellus nulla, id rutrum elit.

Gallery
Morbi pretium consectetur dui, non consequat turpis sollicitudin sit amet. Cras suscipit pharetra mollis. Curabitur ornare egestas ante non pulvinar.

Find Us
Quisque nulla risus, consequat quis consequat eu, facilisis quis tortor. Ut nec nulla id urna tincidunt bibendum a eget est. Integer interdum gravida placerat.

Some Cafe 2012 ©

FIGURE 5

A pure HTML5 template for a cafe.

Popcorn!

PART 2

Mastering sound - advanced editors & effects

In part two of our masterclass on digital sound, **Mike Le Voi** examines the plug-ins and advanced editors a sound expert would use in preference to free ones.

IN THIS SERIES

This masterclass covers everything you need to know about editing and manipulating sound for music production, listening enjoyment and video.

APC EXPERT

MIKE LE VOI

Mike is a PC enthusiast who cut his teeth with DOS and assembler programming in the 1990s. He is interested in all aspects of sound and video and is an active member of Brisbane's 4MBS radio concert recording team. He regularly takes multiple laptops and handheld recording devices to major classical music concerts. As a life-long audio nut, he specialises in high quality audio production. He started with tape recording in the 1970s and has progressed through to current high end digital recording. One of these days he may even get rid of his LP collection!

A sound editor lets you manipulate sound files and achieve the effects you want. For instance, all basic editors provide simple ways to fade in and fade out sound. If you're adding a basic music track to a home video, you're probably going to fade in the music at the beginning and fade it out at the end. If you intend to mix music tracks together, you'll be doing a lot of cross-fades, where you create a seamless join between one piece of music and another.

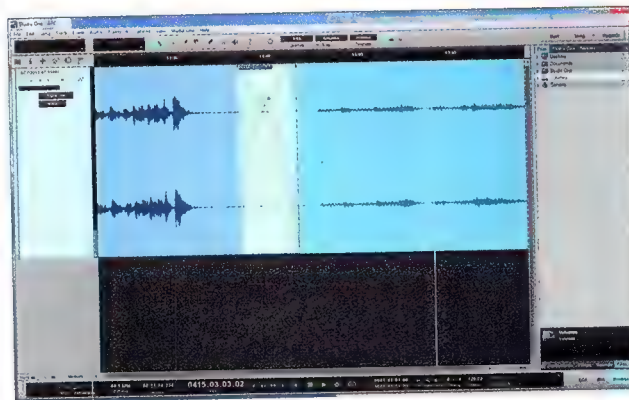
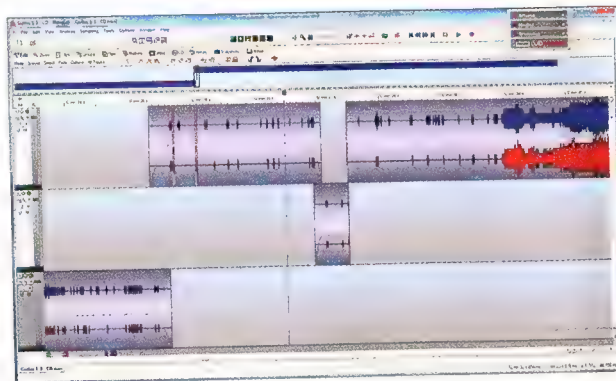
Using a sound editor, you can do things like in the screenshot below, where you can see a complicated use of cross-fades across multiple tracks, which are being merged down to a single stereo file. In a situation like this, you need to have precise control of the fade length for each sound clip, as well as the shape of each fade. Without this control, you'll hear the edits when the resulting file is played.

Once the edits have been made, you'll probably want to add effects to one or more tracks. This could be simple, like adding some reverb or varying track levels. Alternatively, you may want to try to remove unwanted background noise. Once you've added any effects, you'll master the sound for CD or video using such tools as dynamic range compression.

There are many editors and Digital Audio Workstations (DAW), some of them very expensive. However, for the scope of this article, we'll examine some advanced editors that have a very reasonable price for the features they provide.

PRESONUS STUDIO ONE 2 FREE

PreSonus Studio One is an advanced editor with multiple paid versions, each with different features. However, there is a free



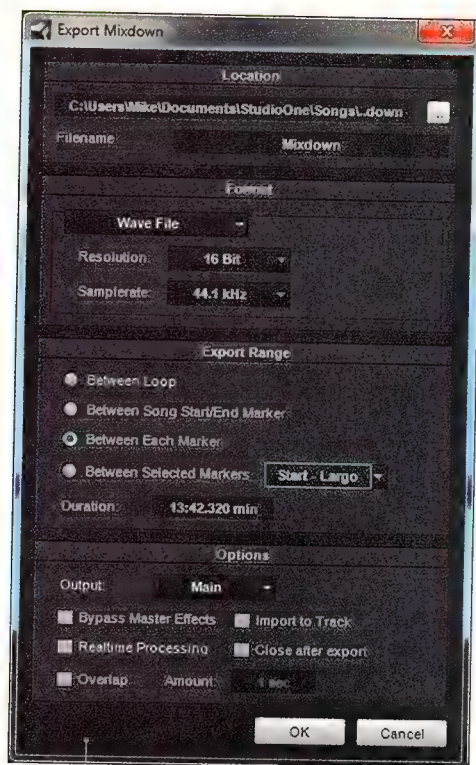
Simply overlap two clips to create a cross-fade in PreSonus.

version for those with basic editing requirements. You can download it from studioone.presonus.com/free.

The downside to the free version is that you can't use third-party plug-ins. However, there are some basic ones built in, such as reverb. Secondly, there's no support for features like mastering to CD. You have to pay for an upgrade to be able to do this.

Nevertheless, the editor is easy to use once you get the hang of the keyboard shortcuts. You use E to zoom in and W to zoom out. Once you've found the edit point, you can click Alt+X to split the track and then drag the ends of each clip to remove the bits of sound you don't want. Then you overlap the clips and click 'X' to create a cross-fade. You can even drag the cross-fade left and right to finetune it. You create song markers using 'Insert' and then you can export all songs using 'Song > Export Mixdown'. Thus, you could do your difficult editing in PreSonus and then apply your VST effects using Audacity. However, if you do a lot of sound processing, you'd probably be better off upgrading to a paid version or using other software.

This clip shows a cross-fade across multiple tracks in WaveLab.



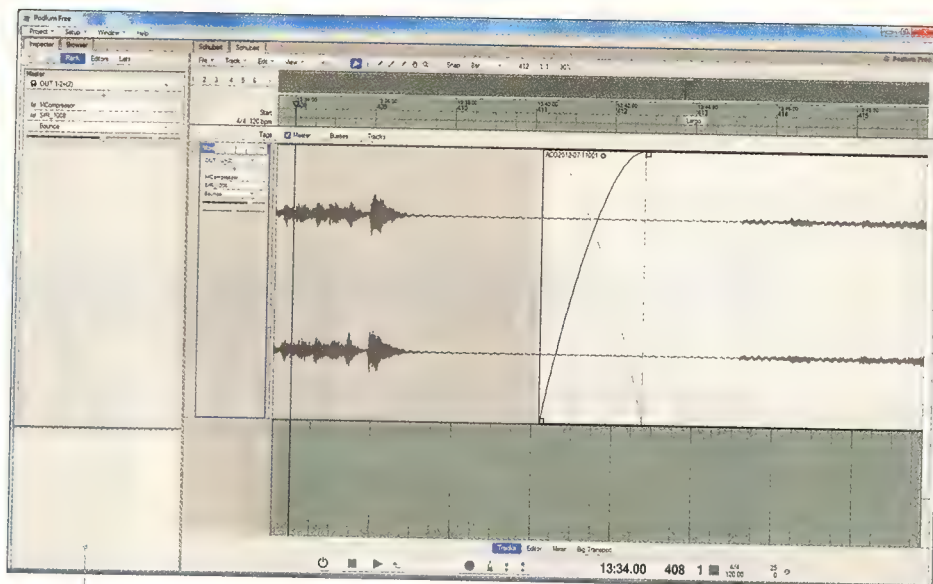
You can export your music from PreSonus to add extra effects in another program.

PODIUM

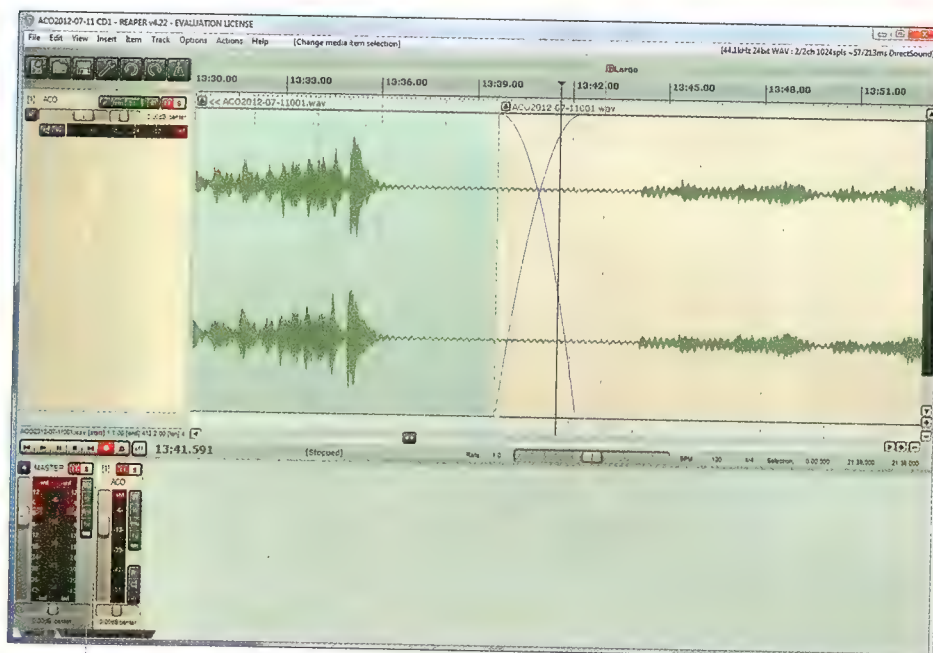
Zynewave Podium (www.zynewave.com) can be purchased for US\$50, but there's also a free version. It has the advantage over Studio One in that it supports VST plug-ins, so you can shape the sound before exporting the final soundtrack. However, there appears to be no way to export multiple files (CD tracks) based on a single project with markers. Keyboard shortcuts aren't as easy to use as Studio One. For example, to zoom in or out you hold Ctrl+Alt and use the mouse wheel. Alt+T will split a clip. Cross-fade is easy to do, as you simply delete the bits of sound you don't want and then slide one clip over the other. There are 11 different cross-fade shapes, so

you can easily pick the one you need for a seamless edit. There's also a 'Mixer' section, which allows you to set individual VST effects per track. You can turn individual effects on or off for auditioning. Exporting the final file is simple, but with limited options. If you only want to edit single songs at a time and apply various effects before rendering, this editor will do what you want. There are many freeware VST plug-ins on the internet, which you can use to enhance the

In the mixer, you can set individual VST effects per track in Podium.



Creating a cross-fade is easy in Podium.



Drag one clip over another to create a cross-fade in Reaper.

sound. However, for serious CD mastering, this program isn't as easy to use as others.

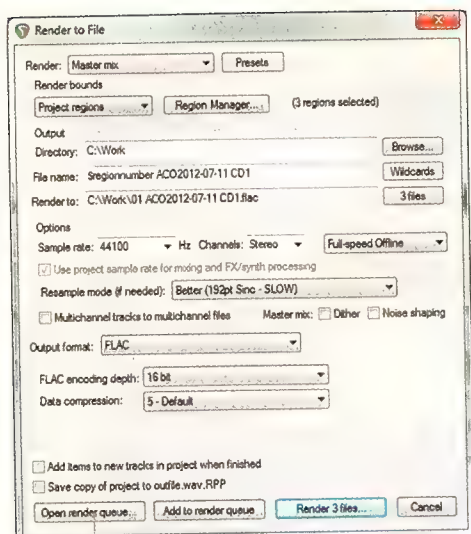
REAPER

Reaper is probably the best bargain editor available (www.reaper.fm). It's not free and you're expected to purchase it after 30 days. For individuals, the cost is only US\$60 and for that you get a really powerful editor and sound processing package. Editing is really simple and the keyboard shortcuts are easy to use.

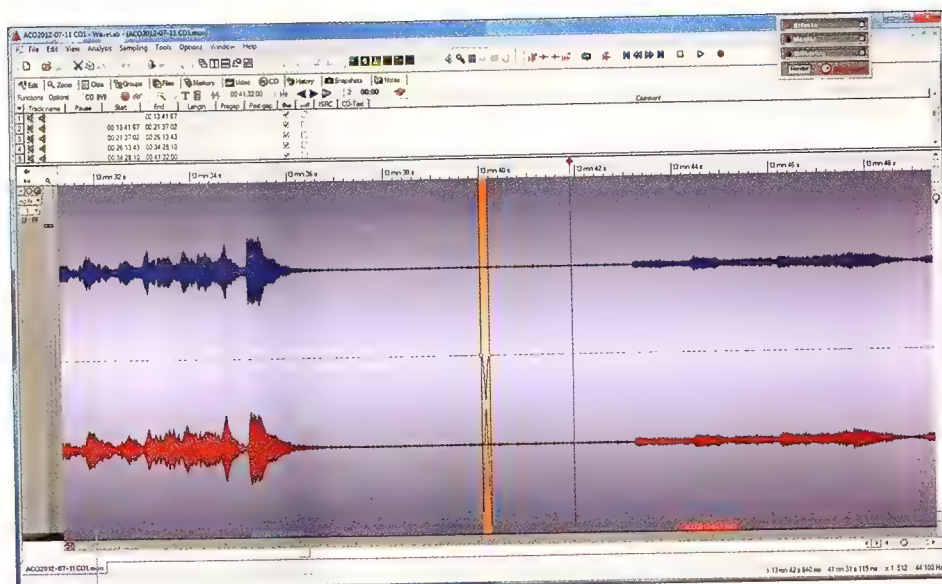
The up and down arrows allow you to zoom in and out. You drag the end of each sound clip to shorten it as required. You then drag one clip over the other to create a cross-fade. Once you've finalised the cross-fade, you can

lock the two clips together by Ctrl+clicking each clip and then hitting G. This is incredibly useful, as you don't want to unlink these clips by mistake. You insert markers using M and you click the marker to edit its name. Each track can have DirectX or VST effects. Once added, you can audition the effects by quickly turning them on or off during playback.

To export multiple .WAV files for each track/marker, you first need to create one region per track. This is done by double-clicking the time line between each set of markers and then hitting Shift+R. This is slightly cumbersome if there are many tracks. Once all regions have been created, you can use 'File > Render' to create the files. Reaper has many options, so you can render



In Reaper, you can render to a range of formats for burning or exporting.



WaveLab has multiple marker types to define track start and end points.

to CUE/BIN for CD burning or render to WAV, FLAC or even MP3.

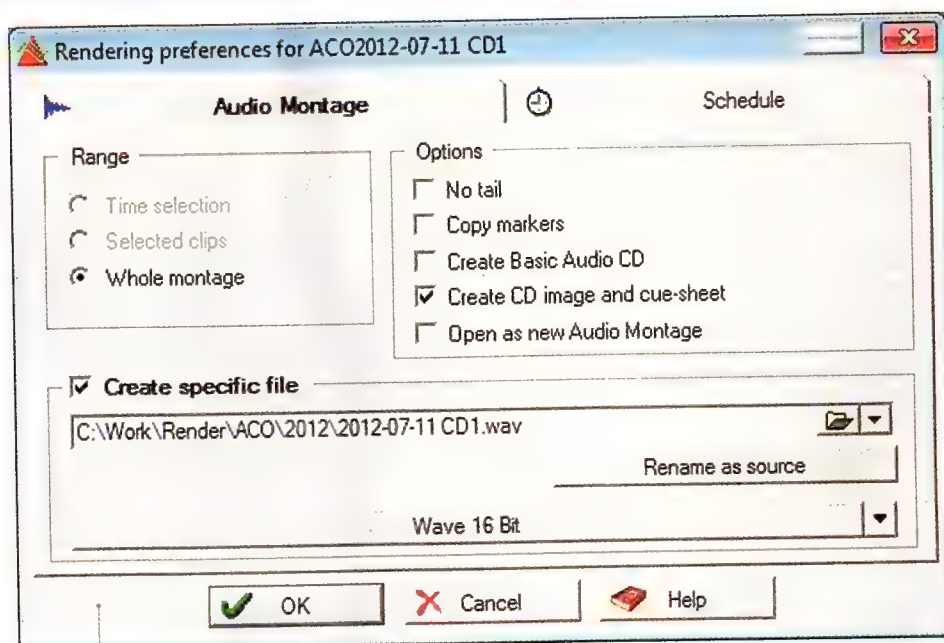
WAVELAB

To conclude this comparison, I'll briefly discuss WaveLab. I'm still using WaveLab 5, as it does everything that the other programs do and more. The latest version of WaveLab is 7, but it's much more expensive compared to Reaper. Navigation is the same as Reaper using zoom in, zoom out and split. Cross-fades are also handled the same. What WaveLab does in addition, however, is to have multiple marker types, which define CD track start and end points. You can even define pre-gaps, which allow a track to have a countdown interval before it. As with Reaper, both DirectX and VST effects are supported. Finally, you can use the 'Render' function to render to CUE/WAV for CD burning.

PLUG-INS & EFFECTS

Plug-ins are important because a crucial aspect of sound effects is that you must be able to audition sound files in real time and change them as you listen. For this, you'll commonly use audio plug-ins that can manipulate the sound on the fly. There are two main types of plug-ins: DirectX or VST (Virtual Studio Technology). Many useful plug-ins are VST only, so you make sure you're using an editor which supports this standard.

There are many hundreds of free VST plug-ins available on the internet. If you have a close-miked sound recording that sounds very dry, you may like to add some artificial reverb. One of the most realistic ways to do this is to use SIR (tinyurl.com/cs5ogdf) and some Impulse Responses (www.voxengo.com/impulses). Without going into the maths of this, SIR reproduces the original performance space, based on the impulse. Here's how to make your recording sound like it was recorded at the Musikverein Concert Hall in Vienna!



Use the 'Render' function to render your music for CD burning.

You may also like to adjust the treble/bass of the recording. There are some great freeware plug-ins here (www.meldaproduction.com/freestvplug-ins). In the screenshot on page 120, we're boosting the bass quite a lot, cutting some of the midrange and boosting the treble a little. You can draw any shape you like and quickly audition the results.

If you have a noisy recording, you can also try to remove the excess noise and leave the desired sound. This isn't an easy task. Audacity has a noise reduction effect and there's a VST plug-in available at tinyurl.com/bvgubfv. Both programs require you to select a section of the recording with only the noise in it. You then apply this noise profile to the whole recording. You should be prepared to experiment here with the noise profile itself

and the amount of noise reduction required. In my experience, always try to lower the noise floor by only 5-10dB. If you try to lower the noise by more than this, you'll actually be able to hear the effect.

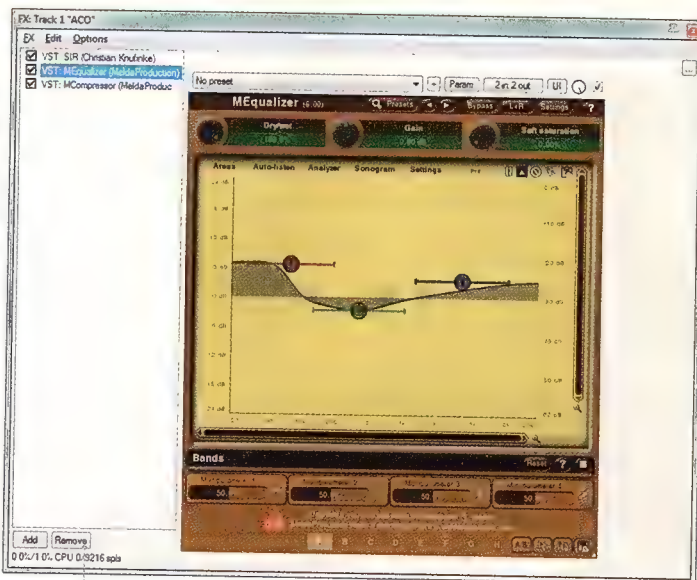
There are also many plug-ins available that intentionally distort the sound as opposed to making it clearer or more pleasant. The Chorus effect gives the impression of multiple instruments playing when there was only one – think of a choir versus a solo voice.

Flanging is an artificial effect much used in pop music, where two identical sounds are slightly delayed by constantly changing small amounts. This sort of effect was first used by The Beatles and other groups of the 1960s!

There are plug-ins that purposely distort the sound and others which can make a voice



SIR is an effect that can reproduce the original performance space.



Here we're boosting the bass and treble, while cutting some of the midrange.

sound like a robot (vocoder effect). You can use Wah-Wah, like on an electric guitar, or you can use vibrato to make the sound wobble.

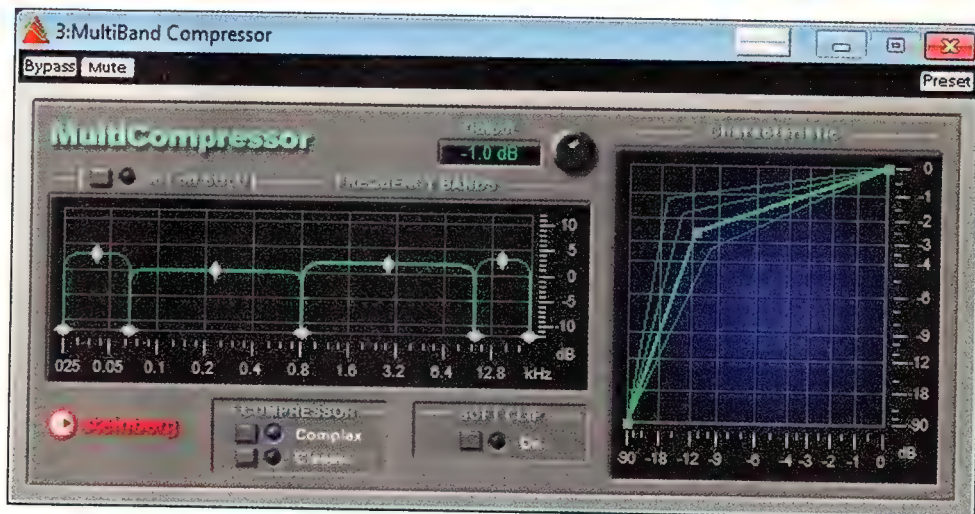
A more useful plug-in is one that does pitch shifting. With such a plug-in, you can raise or lower the pitch of the sound by a small amount without changing the duration of the sound. This can be useful to fix someone who's singing flat when you need to mix their voice with a pre-recorded song. I've even used this to dub a single note into a violin solo where one note was ruined by someone making a noise on stage!

It's impossible to cover all possible plug-ins in this article. Google free VST plug-ins and be amazed at what's available.

MASTERING

Mastering is where you process the final mix for CD or video production. You'll want to boost the volume if it's too low. You may also want to slightly compress the dynamic range of the sound to make it easier to listen to in the car or on your iPod. With a compressor, you choose the threshold (typically -20dB) and the compression ratio (2:1 or less). As with any audio effect, less is better than more. You don't want to win the loudness war and make the track unpleasant to listen to (tinyurl.com/v76kw).

If you have more expensive plug-ins, you can use what is called multiband compression. With multiband compression, low and high frequencies can be compressed more than midrange to give a brighter, punchy sound. Once again, be sparing with such effects and choose the desired sound after much auditioning. Make sure the resulting file never exceeds 0dB on the sound meters. Digital audio isn't like a cassette deck. Anything in excess of the maximum sound level available will be unpleasantly distorted. You may want to include a VST limiter plug-in during the mastering stage to prevent this.



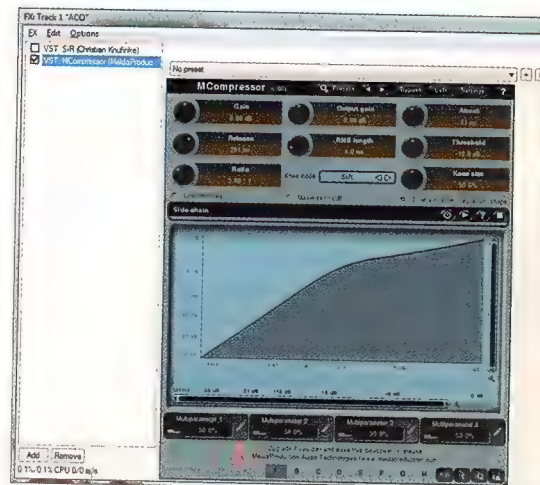
With multiband compression, low and high frequencies can be compressed more than the midrange.

If you're mastering 24-bit recordings to 16-bit for CD, you can apply what's known as dither to the final .WAV audio file during the rendering process. Dithering will apply a very small amount of randomisation to the lowest levels of the digital audio stream. In general, this can make the final master more pleasant to listen to. Dithering isn't applicable to .MP3 files. Reaper can dither the final master for you.

CONCLUSION

If you're not spending most of your audio editing time producing CDs, then Reaper is the program for you. If you want more features than Reaper provides, WaveLab or another high-end audio editor will likely be required. There are many free VST plug-ins available, so do some searching and download a few.

In the next masterclass, we'll cover the many audio file types available and how to use and convert them. Stay tuned! **ATC**



Compressing the dynamic range makes it easier to listen to the sound on your iPod.



TINY WINGS HD

Wonderful, slippery thing.

@ tinyurl.com/dxskbds

\$ \$2.99

✓ Multiplayer is super fun.

✗ I can never win a multiplayer match.

IOS

Just when I thought I didn't have any more love for a game, I managed to squeeze a little out for the updated content and iPad feature of *Tiny Wings HD*. The mechanics of the game haven't changed – with literally one finger, touch anywhere on the screen to help a flightless bird swoop, dive, gain momentum and 'fly' along a hilly landscape. The best feature of the new iPad HD version, however, is the split-screen multiplayer. Players use opposite ends of the iPad to get their bird to the end of the level first. Win the race and get a time penalty in the next round. It's hilariously addictive, but prone to start a few in-house arguments.

Troy Coleman



Spec Ops: The Line

There's sand in my morals

PC

@ www.specopsthegame.com

\$ PC \$69.95

For my entire shooter career I've been begging for one thing: a fantastic story. One that challenges not only my skills, but also my morals and ethics. One that's not the average 'militant faction X has stolen the nukes' heroic pectoral-fest. I thought, for a little while at least, that *Spec Ops: the Line* was that game. If only for the source material it was based on: *The Heart of Darkness*, or more appropriately, its Vietnam War-themed ancestor in *Apocalypse Now*.

The game takes place in modern Dubai. The city has suffered irreparable damage at the hands of a tremendous dust and sandstorm, and the civilians are in need of salvation. Colonel John Konrad, on the way home from a tour of Afghanistan, volunteers his 33rd battalion to aid in the relief efforts. The storms intensify and Konrad ignores US orders to evacuate and declares martial law in Dubai to 'help' the locals. Shortly after, a cryptic transmission is received so the military sends in a three-man Delta team (with our protagonist) to figure out what's happening and get to Konrad.

This is classic third-person, cover-based shooter territory and players should expect little more than the standard run, gun, hide and pound a bunch of enemies in the face with bullets to progress. Where *The Line* differs somewhat is how the protagonist's relationship with his teammates plays out (and ultimately deteriorates) concurrently with the campaign. It also attempts to peel back the faceless killer and mindless slaughter it and other shooters present as gameplay, by focusing on the actual consequences of pulling the trigger. There're several points throughout the campaign that challenge



players to take a step back, assess their actions and question what it really means to take another life. For the most part this is handled reasonably well, though it feels so forced and ham-fisted that it borders on cheesy. It doesn't help that the lead-up to such times is spent mindlessly blasting enemies. So why would one more corpse make that much difference?

Weakening the game's resolve further is the combat and gunplay, which feel as weighty and effective as shaking a feather. In fact, the copy/pasted combat is what truly lets it down and even those are overshadowed by poor AI and some absolutely awful pathing and cover mechanics.

Spec Ops: The Line is successful if only for the fact that it's cemented my thoughts on exactly what I want from a shooter. As flawed as it is, it's a dipped toe in the blood-filled pool of mature, psychological storytelling I'm desperately yearning to bathe in.

Troy Coleman

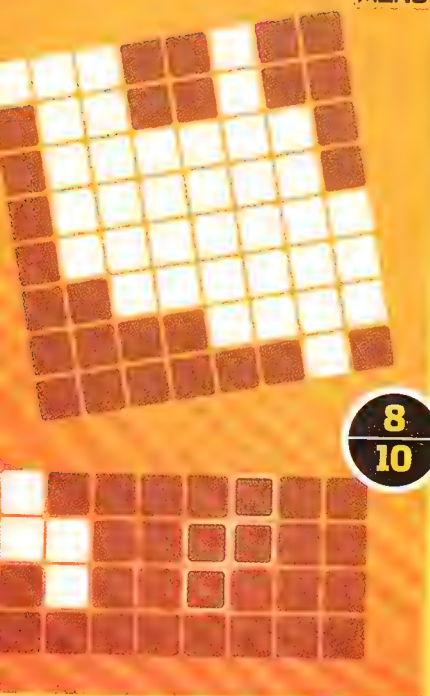
✓ Tries to do what other shooters don't.

✗ Gameplay compromises the story, ineffectual combat.

8
10

ore: 100

MENU



8
10

DOPTRIX

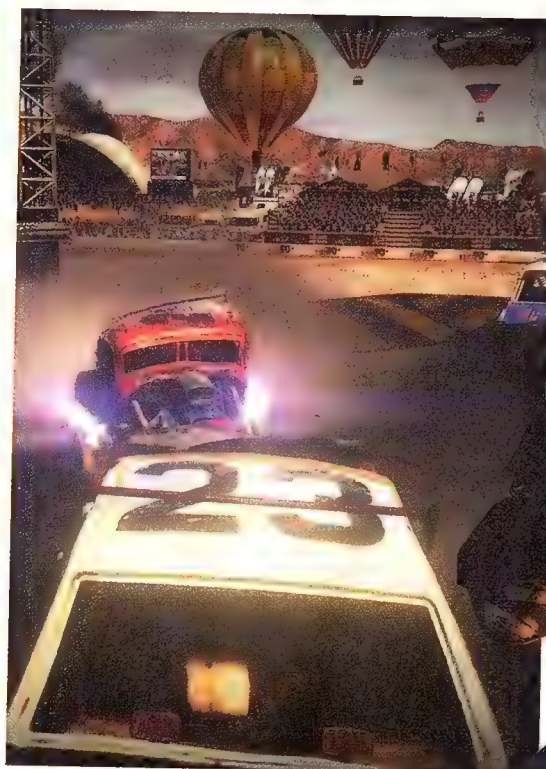
Like a Tetronimo baby. Right round round round.

- @ doptrix.com
- \$ iOS \$0.99
- ✓ Fantastic new take on *Tetris* mould; fun to wrap your head around.
- ✗ Still feels a little too familiar to be mind-blowing.

IOS • ANDROID • BROWSER

OK, so games modelled on the classic *Tetris* formula aren't a scarcity; in fact, I'd hazard a guess that *Tetris* has been the source of inspiration for more games than any other. *Doptrix* takes the block-clearing phenomenon and gives it a wonderfully simple twist: as well as controlling when and where the Tetriminos land, you also get to play as the board. The controls are all gesture-based, with the idea that players rotate and flip the board to find the best spot to flick the next piece. It's still a battle of attrition as just like in *Tetris*, there's only so long you can last until the pressure of column and row clearing gets too much. Play it while you're waiting for your *Hay Day* crops to grow.

Troy Coleman



DiRT: Showdown

Too much show and not enough go brings us down.

360

@ www.codemasters.com \$ \$79.95

DiRT: Showdown is a racing game in name, but it's one that's taken on a veneer of 'extreme' attitude and with it, dropped the racing that made the series famous, right back to when it was Colin McCrae racing. What you get instead is a career mode that's as much focused around doing wacky stunts, pushing cars off ledges, destroying blocks or competing in demolition derbies, as you move through its career levels.

The stunt-centric events are fine, but there's little here that's really original and that makes *DiRT: Showdown* pretty tough to recommend. The chances are high that if you like racing games, you've probably played something very similar before, and if you bought it on the basis of the series' racing heritage, you'll equally be let down by the terribly forced 'in your face' commentary and styling of most events.

There's been a clear decision somewhere along the line not to make things too challenging, so even some of the stunt races lack the kind of finesse that could have made this a top-tier racing title. As for the online Racenet matchmaking service, we never actually got it working. Most game events are short and ultimately uneventful, with crashes that have plenty of sparkle, but lack real impact.

Alex Kidman

- ✓ Variety of events on offer.
- ✗ Not enough actual racing, attitude feels forced.

7
10

The Walking Dead Episode 1

Reigniting my passion for the walking dead.

MAC

@ store.steampowered.com/app/207610 \$ US\$24.99

Protagonist Lee Everett is in the back of a police car out of the city when the driver slams into someone standing on the road and the car tumbles into a ditch. Lee meets up with Clementine, a young girl whose parents are presumed dead.

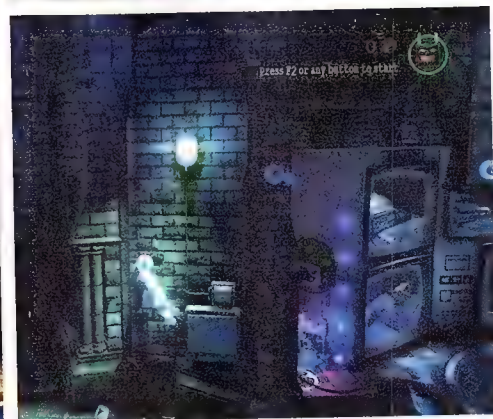
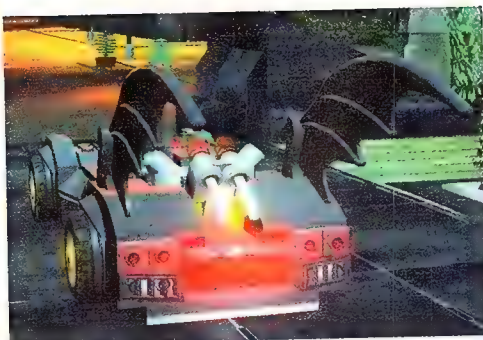
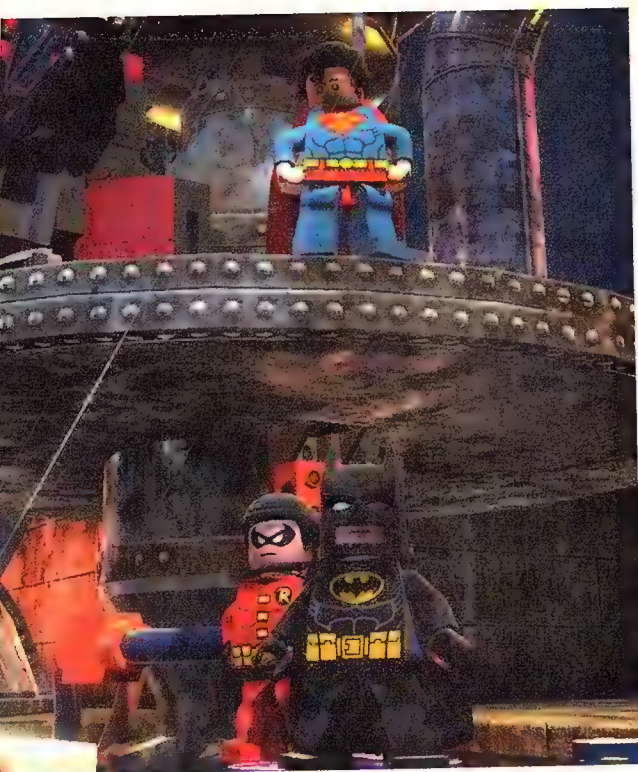
The game is driven by plot and heavily focused on getting the pacing just right. If you're into all-out zombie action blast-fests, then this might not be for you. There's still the inevitable brain-smashing action, it's just that when it happens, the emotional character connection makes the action feel far more visceral, awful and genuinely harrowing.

The Walking Dead is all point-and-click adventure with some puzzling and limited space exploration, but time really is the silent hero here. Expect to spend a good portion of the almost three hours of play here navigating the threaded character dialogue as well as moving from point A to B and back to figure out the next clues. You're urged to take the time to get to know the other survivors. But caring is the easy bit – the real challenge is when you're asked who to save and who to sacrifice. It's not often a game leaves us pondering the fragility and vulnerability of our race and... damn it, now I feel all emotional.

Troy Coleman

- ✓ Immersive, intelligent and emotional writing.
- ✗ Need to wait for the next instalment.

9
10



LEGO Batman 2: DC Super Heroes

Making LEGO villains brick themselves.

360 • PS3 • XBOX 360

The Batman of today is all dark, brooding Christian Bale-type antics, right? Well, not according to the cheery and bright world of *LEGO Batman 2*, which never really stepped beyond the garish hues of the Adam West era. Like its predecessor, *LEGO Batman 2* isn't based on a movie per se; just a convoluted storyline that sees the Joker and Lex Luthor teaming up for assorted acts of villainy, not to mention smashing a lot of LEGO. It's your job as the caped crusader (and sidekick Robin) to take the bad guys down, one brick at a time.

If you've played any LEGO game, you've played *LEGO Batman 2*, and that's both a curse and a blessing. It's really easy to pick up and play, and it has the same gentle humour that's served LEGO games well in the past, accentuated by some top-notch voice acting. At the same time,

@ dcniversesuperheroes.lego.com \$ \$79.95

the combat is essentially the same as it was all the way back in the first *LEGO Star Wars* game and it's not without intermittent glitches – we sometimes got stuck in scenery or dropped off ledges due to dodgy computer AI.

This is a much better game with a human co-player, although outside Batman, Robin and Superman, there's less to do with the rest of the Justice League until you run through the game's full story. That still leaves all the OCD-inspired bonus missions and objectives to unlock in this seriously large game.

Alex Kidman

- ✓ Lengthy story mode, speech adds a lot of humour.
- ✗ Repetitive combat, intermittently buggy.

9
10



HAY DAY

All the fun of the farm...

- @ tinyurl.com/brngna3
- \$ Free
- ✓ Cute, fun, addictive farming.
- ✗ Updates adding semi-compulsory Facebook connectivity, some features require online connection, so many eggs.

IOS

...without any of the dirt under the fingernails and best of all, it's free. It's not a new concept by any means, but the fun, approachable and completely optional style of play makes for an attractive package. The idea is simple. You take ownership of a modest little farm, producing only a couple of things that can be used to 'fill orders' for people and places in the local area, thereby earning money and experience points. Earn enough XP to level up and learn how to grow new things, make more complex goods and buy new machinery, animals or decorations. Being a free app means that in-app purchases are lurking, but thankfully they are completely optional and offer little more than a fast track to task completion. Developers Supercell are starting to slip in a few features that require Facebook – let's hope they see the folly of their ways. After all, a 40% hit to Zynga stock is no coincidence.

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INHERIT THE EARTH

IN SOVIET RUSSIA, 3D FILMS WATCH YOU



It has recently come to light that the first 3D films didn't actually come from the US, but rather from the USSR. Way back in 1911, Russia screened the world's first 3D film – several years before the US did.

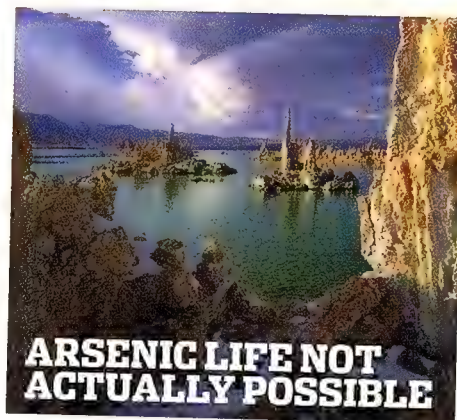
The first commercial 3D film (I'm supposing this means one with a plot) entitled *Concert or Land of Youth*, was first shown in 1941, only a few months before the Soviet Union joined World War II.

Viewers watched the film, not through glasses, but through a wire grid that meant the left and right eye saw two different images at the same time, creating an illusion of depth. The system, called stereo cinema, was created by Soviet inventor, Semyon Ivanov.

The *Concert* film was mainly black-and-white, but had sections where it burst into colour – a technique also used in Hollywood for the 1939 hit *The Wizard of Oz* – causing a sensation at the time.

The films have recently been restored and digitised by two enthusiasts: Nikolai Mayorov and Nikolai Kotovsky. Mayorov found the negatives and sound recordings, still in a good condition, at the State Film Fund. He worked first on the black-and-white sections, and has also restored some of the more complex colour sections.

He first showed the film, which he has adapted for viewing through modern 3D glasses, at a specialised archival festival in the Moscow region in 2011.



Back in 2010, *Science* published a paper by NASA scientists claiming that bacterium in the arsenic-rich Mono Lake in California "redefined the building blocks of life" by swapping phosphorus for arsenic in its DNA and cell membranes.

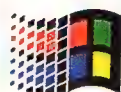
Science is in a state of constant revision and the paper has since been tested and probed by other scientists. Two follow-up papers have recently been published that dispute the claim, which went against the general belief that life as we know it requires six elements to function: carbon, hydrogen, nitrogen, oxygen, phosphorus and sulphur.

While the original authors acknowledged that there were very low levels of phosphate within their study samples, they concluded that this was a level of contamination that was insufficient to permit GFAJ to grow. Two separate *Science* articles "now reveal that, in fact, her medium did contain enough phosphate contamination to support GFAJ-1's growth," said a statement by the magazine.

THE WINDOWS LOGO THROUGH TIME



1.0 (1985)



3.1 (1992)



95 (1995)



XP (2001)



Vista (2006)



7 (2009)



8 (2012)

I thought this was interesting: note the way that the Windows logo has come full circle, with the new logo for Windows 8 looking strikingly similar to the original Windows 1.0 logo.

I actually think the best logo of the lot is the 1985 logo – I enjoy the colour, the round edges, the displaced lines and the minimal feel.

Especially when you compare it to the hokey faux perspective of the new logo.

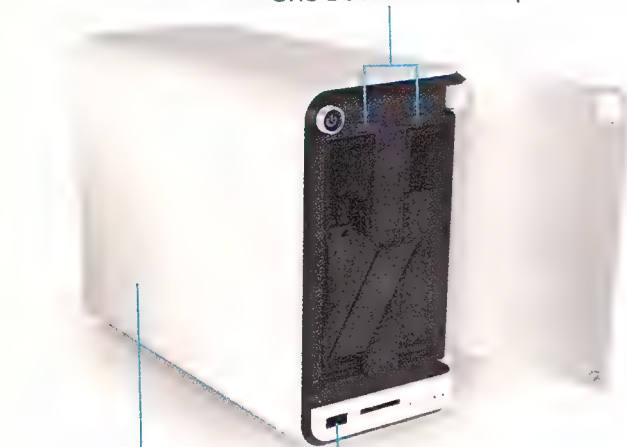
I must thank Minimally Minimal (tinyurl.com/c8w6jop) for pointing it out to me, but also for some interesting musings on the new logo and a compelling vision for a different logo. **END**



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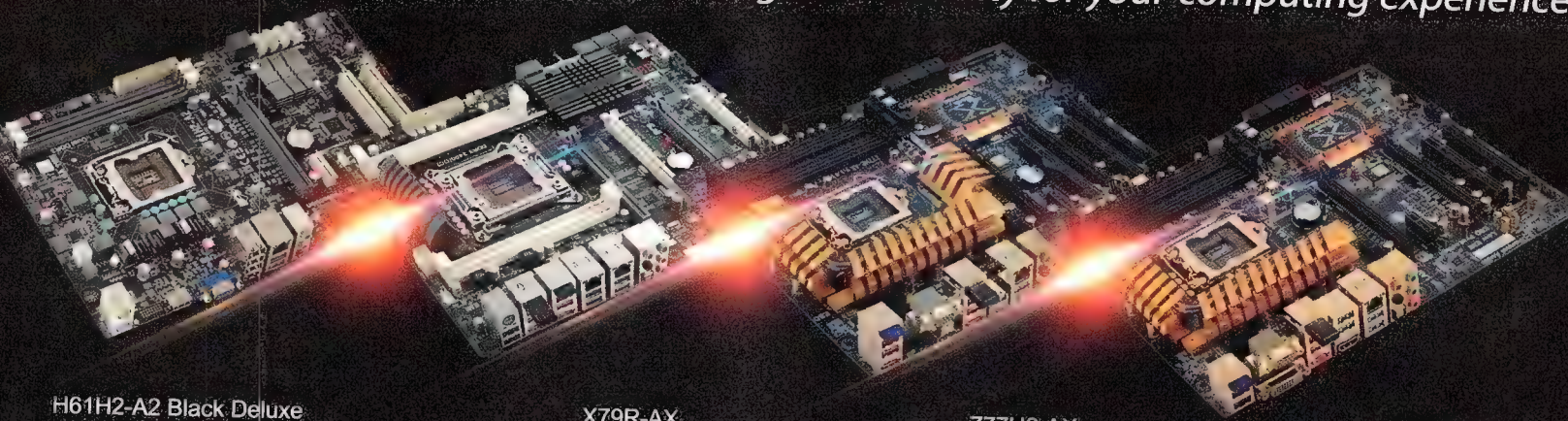
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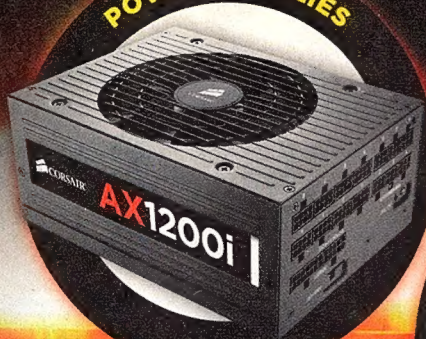


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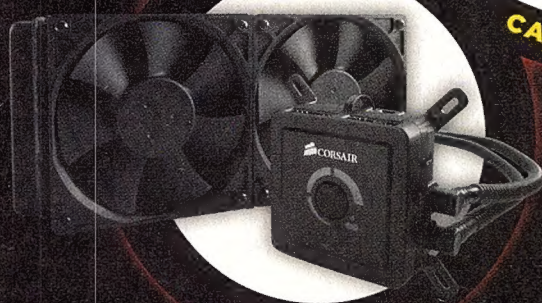
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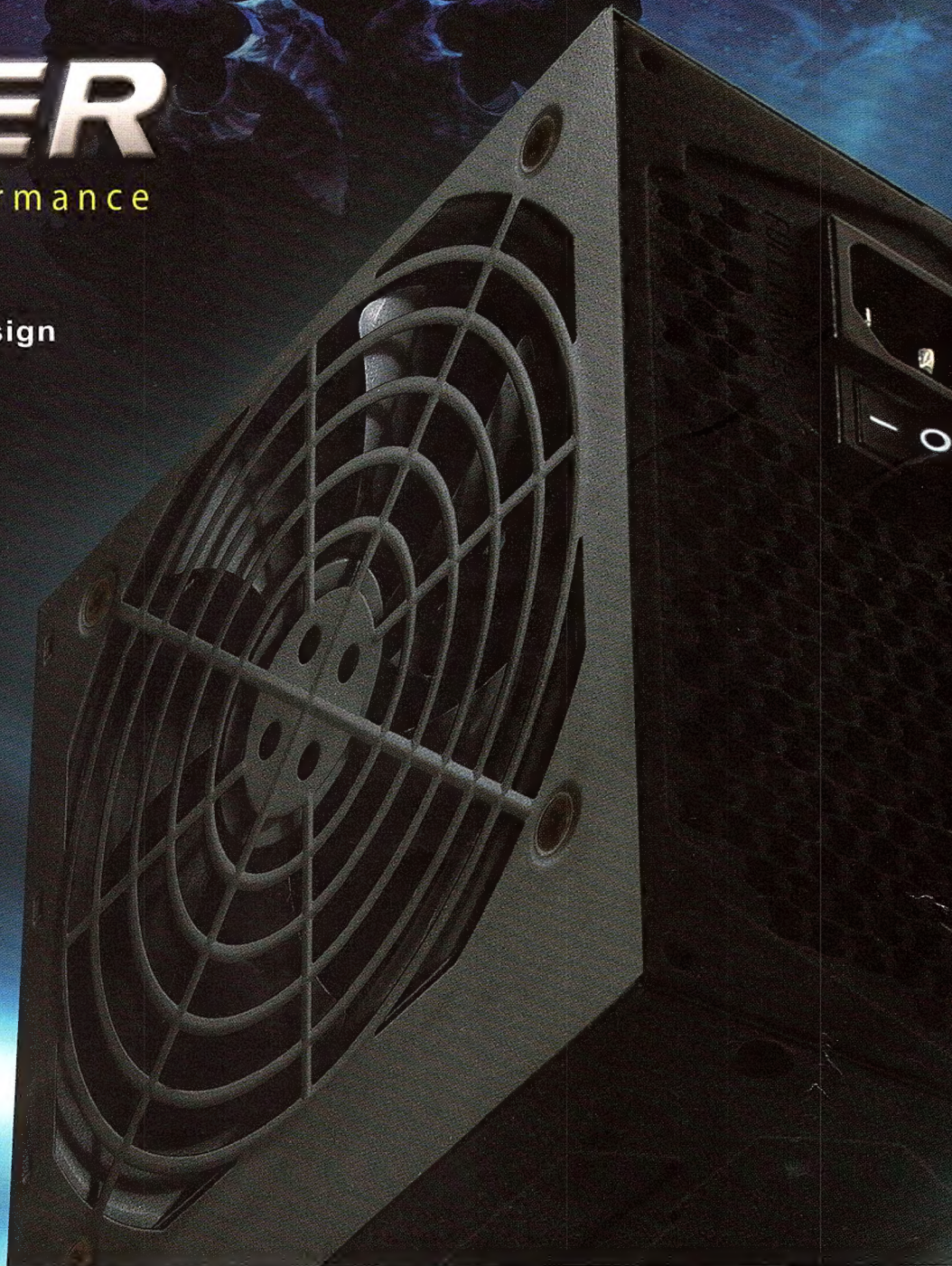
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